Telephony

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Mathematics For Telephone Engineers

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THIRD ARTICLE OF A SERIES on mathematics dealing with alternating current problems, particularly as regards telephone transmission. This article covers simultaneous equations with unknown quantities and their solution by the application of the method of determinants. The two foregoing articles in this series appeared in the May 30 and June 27 issues

THE EQUATION, $4x + 5y = 44$, contains two unknown quantities. The value of y can be found by assuming values of x and substituting these in the original equation. Thus:

$x = 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \ldots$ etc.

$y = 8 \quad 7.2 \quad 6.4 \quad 5.6 \quad 4.8 \quad 4.0 \quad 3.2$

It is evident that there is no limit to the number of solutions which can be obtained, anyone of which may give the absolute value of x and y. If, however, there are two equations, such as

$4x + 5y = 44$ .....(1)

and

$x + y = 10$ .....(2)

the second equation qualifies the first and it is possible to "eliminate" x or y.

Thus, from (1) $x = 11 - 1.25\,y$ and substituting this value for x in (2)

$$11 - 1.25y + y = 10$$
$$-0.25y = -1$$
$$y = 4$$

Substituting this value of y in (1)

$$4x + 20 = 44$$
$$x = 6$$

It leads to the same result if the value of y, which has been obtained, is inserted in equation (2).

Since there is only one value of x and y which will satisfy equations (1) and (2) these equations are known as *simultaneous* equations.

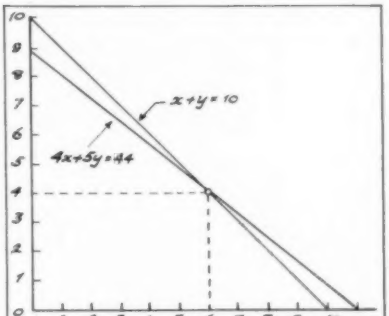


Fig. 21. Graphical Representative of Simultaneous Equations.

In Fig. 21 the plots of equations (1) and (2) are drawn and it will be seen that the ordinates of the two curves are only equal at their point of intersection, where $y = 4$ and $x = 6$.

Alternative method:

$4x + 5y = 43$ .....(1)

$9x - 4y = 51$ .....(2)

Multiply (1) by 9 and (2) by 4, then

$36x + 45y = 387$ .....(3)

$36x - 16y = 204$ .....(4)

Subtracting (4) from (3), x is eliminated. Thus

$$61y = 183$$
$$y = 3$$

Substituting this value of y in either (1) or (2) gives

$$x = 7$$

Second alternative:

$4x + 3y = 32$ .....(1)

$6x - 2y = 22$ .....(2)

From (1) $x = (32 - 3y)/4$.....(3)

and from (2) $x = (22 + 2y)/6$.....(4)

Therefore, $(32 - 3y)/4 = (22 + 2y)/6$.

Multiplying across, $192 - 18y = 88 + 8y$.

Rearranging, $104 = 26y$

Therefore, $y = 4$

Substituting this in either (1) or (2),

$$x = 5$$

Simultaneous Equations With Three Unknowns

Example 1:

$x + 4y + 4z = 44$ .....(1)

$3x + 2y + 2z = 32$ .....(2)

$9x + 6y + 2z = 68$ .....(3)

Multiply (2) by 2

$6x + 4y + 4z = 64$ .....(4)

Subtract (1) from (4)

$$5x = 20$$
$$x = 4$$

Substituting $x = 4$ in (2), then,

$2y + 2z = 20$ .....(5)

Substituting $x = 4$ in (3)

$6y + 2z = 32$ .....(6)

Subtract (5) from (6)

$$4y = 12$$
$$y = 3$$

Substituting $y = 3$ in (5)

$$2z = 14$$
$$z = 7$$

Thus, $x = 4$, $y = 3$, and $z = 7$.

This can be tested as follows: Substitute the values of x, y and z in (1), (2), and (3), then

$$4 + 12 + 28 = 44$$
$$12 + 6 + 14 = 32$$
$$36 + 18 + 14 = 68$$

The whole art of solving simultaneous

equations containing three or more unknowns is the successive elimination of the unknowns by artifice. What artifice is to be used depends upon the equations themselves and practice—first with equations having two and then with equations of three unknowns—will enable the student to rapidly discover for himself what artifice to use. He can manufacture examples by giving x, y, and z, certain values and varying their coefficients. In this way he will soon attain the necessary degree of expertness.

Example 2:

$2x + y + z = 15$ .....(1)

$3x - 2y + 2z = 11$ .....(2)

$x + 3y - 3z = 0$ .....(3)

y can be eliminated between (1) and (2) thus:

Multiply (1) by 2.

$4x + 2y + 2z = 30$ .....(4)

Add (2)

$3x - 2y + 2z = 11$

$7x + 4z = 41$ .....(5)

To eliminate y between (1) and (3), multiply (1) by 3

$6x + 3y + 3z = 45$ .....(6)

Subtract (3)

$5x + 6z = 45$ .....(7)

(5) and (7) are two simultaneous equations in two unknowns and x will be found by eliminating z, thus

$7x + 4z = 41$ .....(5)

$5x + 6z = 45$ .....(7)

Therefore, $x = (41 - 4z)/7$ .....(8)

and $x = (45 - 6z)/5$ .....(9)

Therefore, $(41 - 4z)/7 = (45 - 6z)/5$

or, $205 - 20z = 315 - 42z$ .....(10)

$22z = 110$

$z = 5$

Or, proceed thus:

Multiply (5) by 5 and (7) by 7

$35x + 20z = 205$

$35x + 42z = 315$

Subtracting $-22z = -110$

$z = 5$,

which is the same result as before.

To obtain x, multiply (5) by 3 and (7) by 2

$21x + 12z = 123$ ..(11)

$10x + 12z = 90$ ..(12)

Subtract $11x = 33$

$x = 3$

The values now obtained for x and z can be inserted in any one of the equations (1), (2) or (3) and the value of y will then be determined. Inserting them in equation (1)

$6 + y + 5 = 15$

and $y = 4$.

Determinants

Network problems frequently give rise to a group of three or more simultaneous equations and their solution becomes laborious, more especially if there are more than three unknowns with their corresponding equations. The labor involved may be considerably curtailed by the application of the method of determinants.

Let

$ax + by = c$ .....(1)

$a_1x + b_1y = c_1$ .....(2)

Multiplying (1) by b_1 and (2) by b, then

$ab_1x + bb_1y = b_1c$

$a_1bx + bb_1y = bc_1$

Subtracting

$x(ab_1 - a_1b) = b_1c - bc_1$ and

$x = (b_1c - bc_1)/(ab_1 - a_1b)$

Again, multiply (1) by a_1 and (2) by a

$aa_1x + a_1by = a_1c$

$aa_1x + ab_1y = ac_1$

Therefore

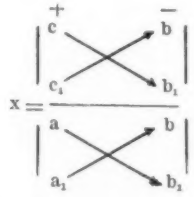
$y(a_1b - ab_1) = a_1c - ac_1$ and

$y = (a_1c - ac_1)/(a_1b - ab_1)$

$= (ac_1 - a_1c)/(ab_1 - a_1b)$

Now such an expression as $b_1c - bc_1$ can be written in the following manner:

The arrows indicate the multiplications to be performed while the products have the signs indicated at the head of the columns. Such an arrangement is known as a *determinant*. The quantities b, b_1, c, c_1, etc., are called the *constituents* of the determinant. The solution for x in equations (1) and (2) would be written:



If the expression for x is examined, it will be seen that the numerator of the determinant for x has its left-hand or leading column equal to the quantities c and c_1 while the right-hand column consists of the coefficients of y written in the order in which they occur in the original equation.

The denominator consists of the coefficients of x and y arranged in the order in which they occur.

PAST AND PRESENT

BY MISS ANNE BARNES,

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SURELY EVERYONE has some enjoyable memories of the past—whether they be of simple home associations or unusual adventures and contacts in the big world beyond the ordinary affairs of life. In either case we may say we live *twice*—the past in retrospection and the present. Happy are they who can live in the past, not for it but rather because of it. We must *subordinate* the past to the present.

Many people might be surprised if they knew, as I do, the number of telephone managers and operators who are loth to change to present-day practices found to be necessary. "Why are these changes in practices necessary?" they ask. "We did not feel the need of changes until you came along and suggested them. Since our subscribers don't complain, why change?"

Telephone managers should focus their attention, and adjust their service in all departments to meet the present-day needs of their public, including those persons who come daily from other towns and cities.

In a few years, we are told, all business places and homes will be air-conditioned. A few years back we were satisfied with hot, stuffy homes and places of business because we did not know we could have anything different. But we complained a great deal, nevertheless. And our complaints were undoubtedly responsible for someone eventually working out our present schemes of air-conditioning. And, as yet, it is in its pioneer stage.

Before very long we are to have a new toll practice. Naturally, there will be some changes. Otherwise, we would have no need of the new practice. When we receive our book let us not weigh the new against the old, for this has already been done by people who know, better than we do, the need for certain changes.

Moral: "The past is for us, but the sole terms on which it can become ours are its subordination to the present."—Emerson.

The expression for y is:

$$y = \frac{\begin{vmatrix} a & c \\ a_1 & c_1 \end{vmatrix}}{\begin{vmatrix} a & b \\ a_1 & b_1 \end{vmatrix}}$$

The denominator is the same as that for x, and the numerator consists of the coefficients of x on the left and the quantities c, c_1 on the right. Note that the quantities c, c_1 take the place of whichever set of coefficients is omitted; those of x in the case of the x determinant and those of y in the y determinant.

Take an actual case, that given at the beginning of the section:

$4x + 5y = 44$ .....(1)

$x + y = 10$ .....(2)

$$x = \frac{\begin{vmatrix} 44 & 5 \\ 10 & 1 \end{vmatrix}}{\begin{vmatrix} 4 & 5 \\ 1 & 1 \end{vmatrix}} = \frac{44 - 50}{4 - 5} = \frac{-6}{-1} = 6$$

$$y = \frac{\begin{vmatrix} 4 & 44 \\ 1 & 10 \end{vmatrix}}{\begin{vmatrix} 4 & 5 \\ 1 & 1 \end{vmatrix}} = \frac{40 - 44}{-1} = \frac{-4}{-1} = 4$$

Supposing that the simultaneous equation had been

$$a\,x - by = c$$
$$a_1x - b_1y = c_1$$

then,

$$x = \frac{\begin{vmatrix} c & -b \\ c_1 & -b_1 \end{vmatrix}}{\begin{vmatrix} a & -b \\ a_1 & -b_1 \end{vmatrix}} = \frac{-b_1c - (-bc_1)}{-ab_1 - (-a_1b)} = \frac{bc_1 - b_1c}{a_1b - ab_1}$$

In the same way,

$$y = \frac{\begin{vmatrix} a & c \\ a_1 & c_1 \end{vmatrix}}{\begin{vmatrix} a & -b \\ a_1 & -b_1 \end{vmatrix}} = \frac{ac_1 - a_1c}{a_1b - ab_1}$$

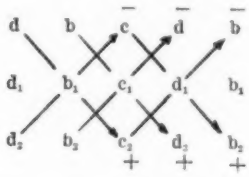
Let

$$ax + by + cz = d$$
$$a_1x + b_1y + c_1z = d_1$$
$$a_2x + b_2y + c_2z = d_2$$

To evaluate x, write down the quantities d, d_1, and d_2 in the order in which they occur. Next write down the coefficients of y and then those of z, thus:

1	2	3
d	b	c
d_1	b_1	c_1
d_2	b_2	c_2

Then repeat the first and second columns so that finally the determinant for the numerator appears as:

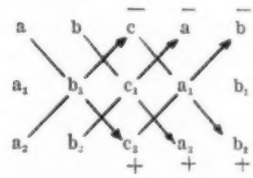


Draw arrows as shown and multiply the quantities connected by them together. Subtract the products of the quantities indicated by the upwardly-directed arrows from those connected by the downward arrows, thus,

$b_1c_2d + bc_1d_2 + b_2cd_1 - b_1cd_1 - b_2c_1d - bc_2d_1$ .....(1)

and this is the numerator.

The denominator is formed by writing in column form the coefficients of x, y, and z, as they occur in the original equations, thus:



△, the denominator is equal to

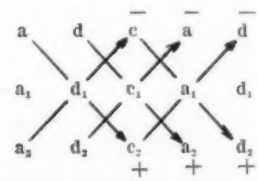
$ab_1c_2 + a_2bc_1 + a_1b_2c - a_2b_1c - ab_2c_1 - a_1bc_2$ .....(2)

Therefore $x = (1)/(2)$.

To obtain y, write down the coefficients as before, replacing those of y by the quantities on the right-hand side of the equations, thus:

The numerator then becomes:

$ac_2d_1 + a_2c_1d + a_1cd_2 - a_2cd_1 - ac_1d_2 - a_1c_2d$ .....(3)



The denominator is the same as before; therefore

$$y = (3)/(2)$$

The value for z may be obtained by the reader as an exercise.

It is unnecessary to write out the expressions as shown in the foregoing examples, this having been done only for the purposes of explanation. Taking the expression for x, it will be noted that the numerator consists of terms *b c d* with varying subscripts and the denominator contains terms *a b c* whose subscripts also vary.

Expansion of Determinants

It will also be noted that the denominator always consists of the coefficients of the unknown quantities in columns and in the order in which they appear in the equations, while, in the numerator, the right-hand quantities of the equations replace the coefficients of the unknown quantity which is being sought. The numerator and denominator both consist of an equal number of terms, half positive, half negative.

The product terms are known as *elements*, their factors being designated the *constituents* of the elements. *a b c* is thus an element made up of constituents *a, b, and c.*

To evaluate a determinant, prefix a plus sign before any element if derived from the leading element by an even number of interchanges, and the minus sign if it is derived from an odd number. The letters are taken in cyclic order, *b* following *a*, *c* following *b* and *a* following *c*. Also the subscripts should be taken so that 2 follows 1, 3 follows 2, and 1 follows 3.

Thus:

Expand $\begin{matrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{matrix}$

Neglecting signs for the moment and writing down the elements with due regard to their cyclical arrangement:

$a_1b_2c_3$, $a_2b_3c_1$, $a_3b_1c_2$, $a_1b_3c_2$, $a_2b_1c_3$, $a_3b_2c_1$.

The leading element is $a_1b_2c_3$.

In the second element, $a_2b_3c_1$, 2 has been interchanged with 1 and also with 3. This is an even number of interchanges and the second element is, therefore, positive. In the third element, $a_3b_1c_2$, 3 has been interchanged with 1 and 2 with 3. The element is positive.

The fourth element is $a_1b_3c_2$; 2 and 3 have been interchanged only and the element is, therefore, negative. In the fifth element, 2 and 1 have been interchanged; and in the sixth 1 and 3—both odd number interchanges—and these elements are, therefore, negative.

Example:

Find the values of x, y, and z from the equations

$$3x + 4y - 4z = 0$$
$$2x - 3y + z = 1$$
$$-3x + 3y + z = 11$$

$$x = \frac{\begin{vmatrix} 0 & 4 & -4 \\ 1 & -3 & 1 \\ 11 & 3 & 1 \end{vmatrix}}{\begin{vmatrix} 3 & 4 & -4 \\ 2 & -3 & 1 \\ -3 & 3 & 1 \end{vmatrix}} = \frac{-104}{-26} = 4$$

$$y = \frac{\begin{vmatrix} 3 & 0 & -4 \\ 2 & 1 & 1 \\ -3 & 11 & 1 \end{vmatrix}}{\begin{vmatrix} & & \\ & -26 & \\ & & \end{vmatrix}} = \frac{-130}{-26} = 5$$

$$z = \frac{\begin{vmatrix} 3 & 4 & 0 \\ 2 & -3 & 1 \\ -3 & 3 & 11 \end{vmatrix}}{\begin{vmatrix} & & \\ & -26 & \\ & & \end{vmatrix}} = \frac{-208}{-26} = 8$$

If the reader works this example out, he will see that the method of determinants is a semi-mechanical process in which algebraic equations are solved by writing down the coefficients of the unknown quantities in a prescribed manner.

In the case of n unknowns, the denominator being the same in the n cases needs only be calculated once, and the labor of obtaining the n solutions is very considerably reduced as compared with that required if the ordinary methods are employed.

As previously stated, the method is particularly useful in network problems because these give rise to a number of equations, each containing an unknown quantity.

Fundamental Properties of Determinants

If the number of constituents is n^2, the determinant is called an nth order determinant and, when expanded, is composed of $\angle n$ elements. (Note— $\angle = 1 \times 2 \times 3 \times 4 \ldots\ldots n.$)

Half of these elements will have the + sign prefixed to them and the remaining half the — sign. Each element is the product of n constituents; no two constituents in the same row or column appearing in the same element.

Thus

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$$

is a determinant of the third order and, when expanded, yields $\angle 3$, i. e. 1.2.3 or six elements as has been seen.

$$\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}$$

is a determinant of the second order and, when expanded, has $\angle 2 = 1.2$ or 2 elements.

Now the whole art in the utilization of determinants is the reduction of a determinant of the nth order into a number of lower order determinants which can readily be evaluated.

Taking, for example, the 3rd order determinant above, when expanded it becomes

$$a_1b_2c_3 - a_1b_3c_2 + a_2b_3c_1 - a_2b_1c_3 + a_3b_1c_2 - a_3b_2c_1$$

by rearranging the positive and negative elements, and this becomes

$$a_1(b_2c_3 - b_3c_2) - a_2(b_1c_3 - b_3c_1) + a_3(b_1c_2 - b_2c_1)$$

which may be written,

$$a_1 \times \begin{vmatrix} b_2 & c_2 \\ b_3 & c_3 \end{vmatrix} - a_2 \times \begin{vmatrix} b_3 & c_3 \\ b_1 & c_1 \end{vmatrix} + a_3 \times \begin{vmatrix} b_1 & c_1 \\ b_2 & c_2 \end{vmatrix}$$

The signs are alternatively positive and negative. Thus a third order determinant is the sum of three second order determinants. The second order determinants are formed from the constituents of the second and third columns, each of these determinants being multiplied by one of the constituents of the first column. The lower order determinants obtained by this process are termed *minors*.

Again, taking a fourth order determinant,

$$\begin{vmatrix} a_1 & b_1 & c_1 & d_1 \\ a_2 & b_2 & c_2 & d_2 \\ a_3 & b_3 & c_3 & d_3 \\ a_4 & b_4 & c_4 & d_4 \end{vmatrix}$$

This can be split up by deleting the row and column in which a_1 occurs. Thus:

$$\begin{array}{cccc} a_1 & b_1 & c_1 & d_1 \\ & | & & \\ a_2 & b_2 & c_2 & d_2 \\ & | & & \\ a_3 & b_3 & c_3 & d_3 \\ & | & & \\ a_4 & b_4 & c_4 & d_4 \end{array}$$

so that the following expression is obtained:

$$a_1 \times \begin{vmatrix} b_2 & c_2 & d_2 \\ b_3 & c_3 & d_3 \\ b_4 & c_4 & d_4 \end{vmatrix}$$

To find the minor for a_2 delete the second column and row, and the result is that given below:

$$-a_2 \times \begin{vmatrix} b_1 & c_1 & d_1 \\ b_3 & c_3 & d_3 \\ b_4 & c_4 & d_4 \end{vmatrix}$$

The complete expansion for the original equation is, therefore:

$$a_1 \times \begin{vmatrix} b_2 & c_2 & d_2 \\ b_3 & c_3 & d_3 \\ b_4 & c_4 & d_4 \end{vmatrix} - a_2 \times \begin{vmatrix} b_1 & c_1 & d_1 \\ b_3 & c_3 & d_3 \\ b_4 & c_4 & d_4 \end{vmatrix} + a_3 \times \begin{vmatrix} b_1 & c_1 & d_1 \\ b_2 & c_2 & d_2 \\ b_4 & c_4 & d_4 \end{vmatrix} - a_4 \times \begin{vmatrix} b_1 & c_1 & d_1 \\ b_2 & c_2 & d_2 \\ b_3 & c_3 & d_3 \end{vmatrix}$$

The signs prefixed to each minor are positive when an odd numbered row is deleted to produce the minor, and negative when an even row is deleted.

To evaluate a determinant of an order higher than the third by this splitting-up process would be excessively cumbersome, and the following rules enable the process to be greatly simplified:

1. The value of a determinant is unaltered by changing the columns into rows or the rows into columns. Thus:

$$\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = \begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix}$$

and

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = \begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}$$

as can be seen on expansion.

It follows from this that whatever law is true for the rows of a determinant is also true for the columns and vice versa.

2. By interchanging any two rows, or any two columns of a determinant, its absolute value is unaltered but its sign is reversed.

$$\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = -\begin{vmatrix} b_1 & a_1 \\ b_2 & a_2 \end{vmatrix}$$

for by direct calculation

$$a_1b_2 - a_2b_1 = -(a_2b_1 - a_1b_2)$$

Similarly:

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = -\begin{vmatrix} b_1 & a_1 & c_1 \\ b_2 & a_2 & c_2 \\ b_3 & a_3 & c_3 \end{vmatrix}$$

3. If two rows or two columns are identical, the determinant is equal to zero.

$$\begin{vmatrix} a_1 & a_1 & b_1 \\ a_2 & a_2 & b_2 \\ a_3 & a_3 & b_3 \end{vmatrix} = 0$$

which can be proved on expansion.

4. When the constituents of two rows or two columns differ by a constant factor, the determinant is equal to zero.

$$\begin{vmatrix} 5 & 1 & 4 \\ 10 & 2 & 6 \\ 20 & 4 & 3 \end{vmatrix} = 5 \begin{vmatrix} 1 & 1 & 4 \\ 2 & 2 & 6 \\ 4 & 4 & 3 \end{vmatrix} = 0$$

The constituents in column 1 are each five times those of column 2, and on expansion the determinant is seen to be equal to 0. This can also be seen from the fact that the removal of the common factor 5 produces two identical columns and the result is, therefore, by (3) equal to zero.

5. If a determinant has a row or column of ciphers it is equal to zero. Thus, on expansion

$$\begin{vmatrix} 0 & 3 & 7 \\ 0 & 4 & 8 \\ 0 & 5 & 9 \end{vmatrix} = 0$$

6. To multiply a determinant by any factor, multiply each constituent in one row or one column by that factor.

$$3 \begin{vmatrix} 2 & 6 \\ 4 & 8 \end{vmatrix} = \begin{vmatrix} 6 & 18 \\ 4 & 8 \end{vmatrix} \text{ or } \begin{vmatrix} 6 & 6 \\ 12 & 8 \end{vmatrix}$$

7. To divide a determinant by any factor, divide each constituent in one row or column by that factor. This follows from (6). It is used to reduce determinants to simpler forms. Thus:

$$\begin{vmatrix} 4 & 4 & 5 \\ 8 & 6 & 15 \\ 16 & 12 & 20 \end{vmatrix} = 4 \begin{vmatrix} 1 & 4 & 5 \\ 2 & 6 & 15 \\ 4 & 12 & 20 \end{vmatrix} =$$

$$4 \times 2 \begin{vmatrix} 1 & 2 & 5 \\ 2 & 3 & 15 \\ 4 & 6 & 20 \end{vmatrix} = 4 \times 2 \times 5 \begin{vmatrix} 1 & 2 & 1 \\ 2 & 3 & 3 \\ 4 & 6 & 4 \end{vmatrix}$$

8. The value of a determinant is not changed by adding or subtracting the constituents of any row from the corresponding constituent of one or more of the other rows or columns. Thus:

$$\begin{vmatrix} a_1 \pm b_1 & b_1 & c_1 \\ a_2 \pm b_2 & b_2 & c_2 \\ a_3 \pm b_3 & b_3 & c_3 \end{vmatrix} = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} \pm \begin{vmatrix} b_1 & b_1 & c_1 \\ b_2 & b_2 & c_2 \\ b_3 & b_3 & c_3 \end{vmatrix}$$

The right-hand determinant vanishes by (3).

9. A determinant can be inverted without changing its absolute value.

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = \begin{vmatrix} c_2 & b_2 & a_2 \\ c_3 & b_3 & a_3 \\ c_1 & b_1 & a_1 \end{vmatrix}$$

10. If the constituents of the first column or row of a determinant are all zero with the exception of the first constituent, it reduces to the product of the constituent and its minor.

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ 0 & b_2 & c_2 \\ 0 & b_3 & c_3 \end{vmatrix} = a_1 \begin{vmatrix} b_2 & c_2 \\ b_3 & c_3 \end{vmatrix}$$

0 enters into any product containing b_1 or c_1. This rule is one of the most important with respect to simplification, and all operations on determinants have as their principal object the reduction to zero of the first constituents of all rows except the first.

Examples of simplification of determinants:

Evaluate

$$\begin{vmatrix} 3 & 16 & 3 \\ -3 & -19 & -23 \\ 0 & 1 & 5 \end{vmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Add first row to second (rule 8)

$$\begin{vmatrix} 3 & 16 & 3 \\ 0 & -3 & -20 \\ 0 & 1 & 5 \end{vmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

This reduces to (rule 10)

$$3 \begin{vmatrix} -3 & -20 \\ 1 & 5 \end{vmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Multiplying up,

$$3[(-3 \times 5) - (-20 \times 1)] = 15$$

The student can always prove the result by writing out the original expression, repeating the columns as required, and drawing in the two sets of arrows.

Evaluate

$$\begin{vmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 \\ 1 & 3 & 6 & 10 \\ 1 & 4 & 10 & 20 \end{vmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Subtract first row from second and obtain

$$\begin{vmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 1 & 3 & 6 & 10 \\ 1 & 4 & 10 & 20 \end{vmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Subtract fourth row from third

$$\begin{vmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 0 & -1 & -4 & -10 \\ 1 & 4 & 10 & 20 \end{vmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Subtract first row from fourth

$$\begin{vmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 0 & -1 & -4 & -10 \\ 0 & 3 & 9 & 19 \end{vmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

This reduces to

$$1 \times \begin{vmatrix} 1 & 2 & 3 \\ -1 & -4 & -10 \\ 3 & 9 & 19 \end{vmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Add first row to second

$$1 \times \begin{vmatrix} 1 & 2 & 3 \\ 0 & -2 & -7 \\ 3 & 9 & 19 \end{vmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Multiply top row by 3 and subtract from third row

$$1 \times \begin{vmatrix} 1 & 2 & 3 \\ 0 & -2 & -7 \\ 0 & 3 & 10 \end{vmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

This reduces to

$$1 \times \begin{vmatrix} -2 & -7 \\ 3 & 10 \end{vmatrix} = 1 \quad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Evaluate

$$\begin{vmatrix} 1 & -65 & 0 & 66 & 0 \\ -1 & -65 & -30 & 0 & 66 \\ 0 & 60 & 0 & -30 & 0 \\ 0 & 60 & 142 & 0 & -30 \\ 0 & 80 & -82 & -35 & -35 \end{vmatrix} \quad \ldots\ldots (1)$$

Add top row to second

$$\begin{vmatrix} 1 & -65 & 0 & 66 & 0 \\ 0 & -130 & -30 & 66 & 66 \\ 0 & 60 & 0 & -30 & 0 \\ 0 & 60 & 142 & 0 & -30 \\ 0 & 80 & -82 & -35 & -35 \end{vmatrix} \quad \ldots\ldots (2)$$

This reduces to

$$\begin{vmatrix} -130 & -30 & 66 & 66 \\ 60 & 0 & -30 & 0 \\ 60 & 142 & 0 & -30 \\ 80 & -82 & -35 & -35 \end{vmatrix} \quad \ldots\ldots\ldots (3)$$

Note: Only one determinant of the next lowest order results from the operation (2) since the leading constituents of the first column are, with the exception of the first, all zero.

Subtracting the third *column* from the fourth:

$$\begin{vmatrix} -130 & -30 & 66 & 0 \\ 60 & 0 & -30 & 30 \\ 60 & 142 & 0 & -30 \\ 80 & -82 & -35 & 0 \end{vmatrix} \quad \ldots\ldots\ldots (4)$$

Adding the second row to the third:

$$\begin{vmatrix} -130 & -30 & 66 & 0 \\ 60 & 0 & -30 & 30 \\ 120 & 142 & -30 & 0 \\ 80 & -82 & -35 & 0 \end{vmatrix} \quad \ldots\ldots\ldots (5)$$

Deleting the second line and fourth column this reduces to:

$$\begin{vmatrix} 30 & -130 & -80 & 66 \\ & 120 & 142 & -30 \\ & 80 & -82 & -35 \end{vmatrix} \quad \ldots\ldots\ldots (6)$$

Dividing the first column by 10 (6) becomes:

$$30 \times 10 \begin{vmatrix} -13 & -30 & 66 \\ 12 & 142 & -30 \\ 8 & -82 & -35 \end{vmatrix} \quad \ldots\ldots\ldots (7)$$

Again only one minor results, since all the constituents but one in the fourth column of (5) are zero. The result is finally:

$$300 \left\{ -13 \begin{vmatrix} 142 & -30 \\ -82 & -35 \end{vmatrix} - 12 \begin{vmatrix} -30 & -66 \\ -82 & -35 \end{vmatrix} + 8 \begin{vmatrix} -30 & 66 \\ 142 & -30 \end{vmatrix} \right\}$$

The completion of the evaluation will be obvious.

Recent Prices in the Metal Markets

New York, N. Y., July 20.—Copper—Quiet; electrolytic spot and future, 9.50c per lb.; export, 9.42½c. Tin—Firm; spot and nearby, 44.37@44.50c per lb.; future, 43.37@43.50c. Iron—Quiet; No. 2, f. o. b. eastern Pennsylvania, $20.50 per ton; Buffalo, $19.50; Alabama, $15.50. Lead—Steady; spot, New York, 4.60@4.65c per lb.; East St. Louis, 4.45c. Zinc—Dull; East St. Louis, spot and future, 4.75c per lb. Aluminum—19@22c per lb. Antimony—Spot, 13c per lb. Quick Silver—$73.50@74.50 per flask. Wolframite—14.50c per lb. Platinum—$40.00.

First Annual Convention of Michigan Association

Telephone men of Michigan are urged to attend the first annual convention of the Michigan Independent Telephone Association, to be held next week, July 29 and 30 at Hotel Olds in Lansing. An interesting and helpful program is being worked out under the direction of Dr. O. M. Vaughan, of South Haven, president, and other officers of the association.

At the first convention session, Wednesday afternoon, Paul A. Martin, publisher of the Lansing State Journal, will deliver the address of welcome. After the response by Vice-President W. J. Melchers, of Owosso, addresses will be made by Secretary-Treasurer Jane Thompson and President Vaughan.

Other features of the opening session will be addresses by Chas. C. Deering, of Des Moines, Iowa, secretary-treasurer of the United States Independent Telephone Association on "The Independent Telephone Company and the Independent Telephone Industry"; by J. S. Hartt, of Madison, Wis., on "Depreciation"; and the presentation of a film entitled "Glass Insulators," by the Whitall Tatum Co., of New York.

Round-table discussions on "Operation and Management," "Construction Practices," "Service Sales and Public Relations," etc., under the direction of R. C. Smith, of the Calhoun County Telephone Co., Goshen, Ind., will open the Thursday morning session. Upon their conclusions the following addresses will be presented: "The National Situation," by F. B. MacKinnon, of Chicago, president of the national association; "What the Future Holds for the Telephone Business," by Louis Pitcher, Dixon, Ill., secretary-general manager, Dixon Home Telephone Co.; "The Commission's Viewpoint," by R. K. Holland, of Lansing, chief engineer of the Michigan Public Utilities Commission.

The subject of "Taxes" will be discussed by M. B. McPherson, of Lansing, chairman of the Michigan State Commission, at the Thursday afternoon session. "Rural Electrification and Its Effect on Independent Companies" will be taken up by E. J. Arnold, of Saginaw, division transmission and protection engineer of the Michigan Bell Telephone Co., and "Unemployment and the Social Security Act," by Wm. Haber, of the Michigan WPA at Lansing.

IN THE NATION'S CAPITAL

By FRANCIS X. WELCH.
Special Washington Correspondent for TELEPHONY

THIS BEING the season for all sorts of straw votes and polls, telephone executives might be interested in a recent survey of public opinion undertaken by the monthly magazine, Fortune. A year ago Fortune took a survey of what people thought about their utility bills and it was discovered that a small majority of people having telephones and electric lights considered their monthly bills quite reasonable. In the same survey it was shown that a bare majority consider their tax bills too high.

From this, Fortune concluded that politically a program of tax reductions would be more popular than one based upon the theory that consumers are bled by privileged monopolies. In its latest survey, Fortune undertook to sound out public opinion on the public ownership question. Here are the results for what they are worth:

	For Public Ownership
Water	60.1 per cent
Light	55.6 per cent
Gas	54.8 per cent
Telephone	50.0 per cent
Trolleys and busses	49.2 per cent

With about 14 per cent of the people answering "don't know" to each part of the question, this shows a considerable majority of those with opinions favoring public ownership. But before you get frightened at these results, consider this correspondent's explanation for these figures which, in view of Fortune's reputation for impartiality and accuracy, were presumably computed in good faith.

Ask the average man on the street if the government should take over and operate anything that he uses often—street cars, milk and bread, and even newspapers—and a surprising number will unthinkingly answer "Yes." There is a sort of grandiose and euphemistic tinge to the phrase "operated by the government" that causes many an unthinking, or at least casual, observer to respond favorably.

Besides that, so many people of late have come to associate governmental operation with something for nothing that one can hardly blame "the Man on the Street" if the thought pops up in the back of his head that government operation may in some way mean free service, or at least a reduced rate for service.

So much for casual inquiry. But what happens when a specific proposition is placed before local voters and the public ownership issue is cussed and discussed by opposing political groups, newspapers, and so forth, until even the dullest citizen is at least generally informed as to what public ownership really means and how it will affect him? Here is a situation with more reliable indications than Fortune's straw poll.

COMING CONVENTIONS

Michigan Independent Telephone Association, Olds Hotel, Lansing, July 29 and 30.

The Illinois Telephone Association, Pere Marquette Hotel, Peoria, September 17 and 18.

United States Independent Telephone Association, Hotel Stevens, Chicago, October 13, 14, 15 and 16.

THE RESULTS of numerous municipal elections held within the past two years on public ownership of utility properties are surprising, in view of the fact that in nearly all cases the voters were assured: (1) that the government (Public Works Administration) would stake the town to from 30 to 45 per cent of the cost of the proposed utility plant, and (2) that the government would loan the balance. In some instances proponents unofficially assured citizens that even the loan need never be paid back unless the plant made money hand over fist.

Barring such elections in tiny whistle-stop communities of less than a thousand population, the results have heavily favored private ownership. Outside of the Tennessee Valley area, Iowa City and Camden, N. J., are the only communities of consequence that have risen to the bait. Cities such as Milwaukee, St. Paul, Birmingham and Cincinnati have overwhelmed such propositions. Of course, PWA wouldn't admit this. In fact, it put out a news release some weeks ago giving a contrary impression but it was obviously window-dressed.

It goes to show that too much reliance cannot be placed on casual inquiries. If you want more concrete evidence of this, tune in your radio some time on the Vox Pop, or Inquiring Reporter, or any other one of the dozen current programs wherein the radio announcer brings his microphone out on the street and asks the passersby various questions.

In a single program, a radio announcer told this correspondent he had the following answers to his questions: "Don't know how many states there are in the Union," "Don't know the name of the King of England," "A synonym is a kind of a soft bun," "Think that capital punishment should be abolished except when the person is guilty," "The government should relieve the drouth by sending water in tank cars."

These boners (by people walking around the streets of Washington, D. C.) are here repeated, not as a sneed at the ignorance of the run-of-the-mill pedestrian, but merely to show that when you suddenly ask an average humble citizen something outside of his usual routine or experience, you are taking a decided advantage of him.

And with all due respect to that esteemed publication, Fortune, when you walk up to the next man you meet on the street and ask his opinion about a complicated and important matter that he has perhaps never even considered before—such as whether the government should take over the telephone business—you need not expect any more intelligent answer than those on the radio program.

MUCH CREDIT for courage, foresight and judgment should be given to the Federal Reserve Board for its recent action in doubling the cash reserve requirement in member banks. The purpose, of course, was to slow down the business boom before it got out of hand. When one stops to consider that this is an election year and (discounting the fairy tale predictions of Messrs. Farley and Hamilton) that the outlook is for a darned close election, we ought to give the New Deal-controlled Reserve Board a big hand for daring to throw cold water at this stage of the game.

Behind the story, however, is the fact that Treasury officials are really concerned about our national debt situation. They well know that if unrestrained speculation makes the nation's economic system run another fever, the resulting depression may not leave enough to pay those thumping big tax bills that are bound to come in after the election is out of the way.

The present situation is not alarming. On the contrary, it is quite rosy—too rosy, in fact, for comfort—and Treasury officials must plan over a long, long range. Here are salient facts of our present national tax situation:

THE TOTAL tax collections are now more than nine billion dollars. In 1900 they were about 1½ billions. In other words, while our national income increased threefold in the last 35 years, our taxes have increased sixfold during the same period. Here is the way the situation is pictured in "Merchants of Debt," an interesting publication recently released by a New York investment house:

In 1932 when taxation had reached more than 20 per cent of national income, taxes and the debt burden grew so onerous that a devaluation of the currency proved politically expedient. Examining the record of France, Germany and Great Britain, as related to taxation and national income, it is found that approximately the same thing has been true. A popular demand for devaluation has arisen—or at least devaluation has become expedient—when taxation exceeded 20 to 23 per cent of the national income.

Analyzing the curve of taxation in the United States for the past 15 years, it appears that taxes may reach an annual total of 12 to 14 billions by 1950 without the Social Security taxes. Including Social Security taxes, according to the present law, tax collections may reach 17 to 19 billions per year by 1950. This would practically mean a doubling of the national tax burden in the space of 14 years.

According to past experience, this huge burden can be borne without a threat for devaluation only if the national income increases from the present approximated 50 billions a year to about 80 or 90 billions by 1950. At present there are no such prospects for such returns during that period unless we have good times right up through 1950. A slump during that period would knock the whole works into a cocked hat. We would simply have to devalue.

Now do you realize why the Federal Reserve Board is taking no chances? It's either caution or default for Uncle Sam. As a prominent speaker said last week at the Institute of Public Affairs at the University of Virginia: "How can you get social security from a government that cannot even keep itself solvent?" Needless to say, the Treasury is scratching its head for the answer to its problem.

Here and There in the Field

Toll Business Increases of Lincoln (Neb.) T. & T. Co.

As a result of the drive made in the last six weeks under the direction of General Commercial Superintendent H. F. McCulla, combined with better business conditions, the Lincoln Telephone & Telegraph Co., of Lincoln, Neb., finds a steady increase of long distance business. On July 3 the Lincoln exchange registered 2,002 offered calls, ranking it with some of the best days in peak times.

The volume has grown so great that company business, save that of an emergency character, is routed only during the afternoon.

▼ ▼

Hamilton, Texas, Exchange to Be Housed in New Home

Plans are nearing completion by the Gulf States Telephone Co. for the erection of a new exchange building in Hamilton, Texas. The modernization plans call for the installation of new central office equipment and the replacement of all telephone instruments for subscribers residing within the city limits. The company expects to occupy its new quarters by October 1.

The exchange building will be of English style of architecture, as shown in the accompanying sketch by Architect Birch D. Easterwood, of Waco. The new structure, which will be fireproof throughout, will measure 30 ft. by 40 feet. It will consist of one story and a basement and will be constructed of hollow tile, with stucco finish on the exterior and plaster on the interior.

The plan of the ground floor includes a public waiting room, manager's office, operating room and restroom for the operators. The basement will house the exchange wiring, power equipment, etc.

Architect's Sketch of New Fireproof Exchange Building to be Erected by the Gulf States Telephone Co. at Hamilton, Texas. The Company Plans to Install New Exchange Equipment and to Replace All Telephones in the City.

In commenting upon the factors which led to the decision to install this new exchange, General Manager Oscar Burton of the Gulf States company said that of 26 towns in which the company operates—outside the area affected by the East Texas oil field—the city of Hamilton has weathered the economic depression much better than any other town in the system dependent entirely upon normal income.

The plan to rebuild and modernize the Hamilton exchange was originally launched in 1929, the proposition at that time having received the approval of 90 per cent of the local subscribers. In the face of adverse economic conditions the project was postponed, however. It was resumed last December when General Manager Burton again brought the matter before the Hamilton Lions Club and Chamber of Commerce. Receiving unanimous approval to the revival of the proposed project, Local Manager Frank Pruitt proceeded to canvass the local subscribers and received their unanimous approval. Thereupon the company proceeded to perfect and execute its plans.

▼ ▼

Useful Ideas: Attachment For Handling Folding Chair

The ordinary light folding chair—commonly used around the shop, office or storeroom—is not an easy thing to grip with one hand and move when open. The other hand is often used in carrying books and other matter used in routine of work.

To facilitate carrying the chair, attach the leather handle from a discarded

suit case to the narrow edge of the back of the chair, as shown in the accompanying illustration. The narrow ring cleats are readily and securely tacked to the hard wood. The slope of the chair throws the handle at all times to the rear and it is never in the way when leaning against the back rest. The soft leather will not injure or mar any wall surface or anything else with which it may come in contact.

The Handle from a Discarded Suitcase Was Attached to This Folding Chair, Facilitating Moving It About With One Hand When the Other Is Occupied in Carrying Other Things.

This also affords a convenient means of hanging the chair upon some wall support, if desired, when not in use.

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Landmarks in History of Electric Talk and Music

Less than 25 years has been needed for the whole development of electric reproduction of music and speech, now used in radio, for public address systems in auditoriums and for the talking movies, it appears from a story of this development written by John Mills of the Bell Telephone Laboratories, and published in the Bell Telephone Quarterly of the American Telephone & Telegraph Co.

The first succsesful attempt at having many people listen to a distant telephone conversation was in 1912, when Yale alumni at a dinner in Chicago were addressed by President Hadley from New Haven, each listener using an individual telephone receiver. A year later the governor of Oklahoma addressed an audience 122 miles away, using loudspeaker equipment. In 1916, 18 loudspeakers set up at the Velodrome at Newark, N. J., carried an address to 12,000 persons.

Four years later the conventions of both major political parties, in Chicago and in San Francisco, were conducted in part by loudspeaker equipment. In 1921 came one of the most elaborate installations ever made, the Armistice Day ceremony of burial of the Unknown Soldier; 100,000 persons at Arlington, Va., 30,000 in Madison Square Garden in New York City and 20,000 more in San Francisco listened to these ceremonies.

In October, 1922, the late Dr. E. B. Craft, of the telephone organization, demonstrated at New Haven, Conn., the first high-quality phonograph records arranged to accompany a motion picture film. In 1926, the first talking movies were licensed. Finally, four years ago, came the climax of development of high-quality electrical reproduction for audiences—the telephonic transmission from Philadelphia to Washington of a concert by the Philadelphia Orchestra.

"Honorable" Subscriber Does Not Respond

The long distance operators employed at the trans-oceanic switchboards of the American Telephone & Telegraph Co. in New York City seldom come in contact with the operators on the other side of the Atlantic, excepting the London operators who take the calls originating in this country and relay them to the point desired in continental Europe, northern Africa and the Near East. On the rare occasions when New York operators do come in direct communication they could hardly be expected to recognize the phrases spoken by the distant operator in her own language, says The Transmitter.

For that matter, no standard phraseology is required of the operators in foreign lands in the wording of their answers to line signals and in subsequent reports on delayed calls. The following examples are what American operators would probably hear:

"Number, Please?"

England: Number, please.
France: J'écoute. (I listen.)
Germany: Hier, Amt. (Here, office.)
Italy: Che numero vourse? (Number, please?)
Portugal: Numero, faz favor. (Number, please?)
Japan: Nanban. (What number?)
Spain: Número. (Number?)

"Line Is Busy"

England: I am sorry, the number is engaged.
France: Occupé. (Occupied.)
Germany: Besetzt. (Busy.)
Italy: Il numero è occupato. (Line is busy.)
Japan: Hanshi Chu. (In the course of conversation.)
Portugal: A linha está occupada.
Spain: La linea es ocupada. (The line is occupied.)

"They Do Not Answer"

England: I am sorry, there is no reply.
France: Pas de réponse. (There is no response.)
Germany: Antwortet nicht. (They do not answer.)
Italy: Non risponde. (They do not answer.)
Japan: Kaiwasha o de ni nari masen. (Honorable subscriber does not respond to ringing of bell.)
Portugal: Nao responde. (Do not answer.)
Spain: No contesta. (No answer.)

Envelope Stuffer, Used Recently by the Orange County Telephone Co., of Middletown, N. Y., Cleverly Encourages the Use of Long Distance Telephone Service.

AROUND THE CORNER

With apologies to Charles Hanson Towner

Around the corner I have a friend,
In this great country that has no end;
Yet days go by and weeks rush on,
And ere I know it a year has gone.
And I never see my old friend's face:
For life is a swift and terrible race.

He knows I like him just as well
As in the days when I rang his bell
And he rang mine:
We were younger then
And now we are busy, tired men:
Tired with playing a foolish game;
Tired with trying to make a name.

"Tomorrow" I say, "I'll call up Jim
Just to show I'm thinking of him."
But tomorrow comes and tomorrow goes,
And the distance between us grows and grows,
Around the corner, yet miles away . . .
"Here's a telephone, sir!
Call Jim right away!"

ORANGE COUNTY TELEPHONE CO.

Plant Men Talk Things Over

Troubleman Unravels Musical Mystery on Line

L. M. Lamkins, manager of the Manawa (Wis.) Telephone Co., reports that recently some of his subscribers complained that they heard music over their telephone lines and that conversation was being interfered with to a marked degree. Upon learning of the trouble, he listened in on one of the lines and, sure enough, there were Heinie and his grenadiers tooting away with all their might.

Although perfectly clear, there was a ghostly and eerie quality about the music—reminiscent of the early days of radio when one would sit up until three o'clock in the morning with a headset clamped over one's ears, said Mr. Lamkins in telling about the experience.

There was an absence of other noises on the line, as of people walking about, clocks ticking or the faint sound of a person breathing into the transmitter. This proved that the trouble was not due to eavesdropping.

The trouble-shooter was sent out to search for the "ghost." After visiting several homes without finding any clue to a solution of the mystery, he noticed —at the next place he visited—a wire coyly emerging from beneath a rug and vanishing out of a window. Upon further investigation, he discovered that an enterprising youngster had connected the aerial wire to one side of the telephone lightning arrester.

It resulted in the radio working fine, and the subscriber was perfectly innocent of the commotion caused on the line. When he wanted to use the telephone, he turned off the radio and hence everything was O.K., so far as he was concerned. Needless to say, the subscriber made a different hook-up for his radio, after the trouble-shooter had directed attention to the matter.

▼ ▼

Evolution of the Ringing Machine

By RAY BLAIN

Perhaps no part of our telephone equipment has seen so frequent changes as the power-operated ringing machine. The first advance over the hand generator in our section of the country was the old Warner pole-changer, which in its day was a marvel. I remember well the first one of these we obtained and how proud we were of its shining beauty.

It required a dry-cell battery of about 20-volts to operate the vibrator and another 90-volt battery of the same type, which was alternated by the vibrator for ringing. The changing of dry cells on this machine, which was all too frequent, was in itself no small task. The vibrating parts and switches, all nickel-plated, were mounted on a marble base and covered with a large glass cake dish or dome.

This may all sound amusing today, but to us then it was an instrument of real beauty and utility. At that time contact metal was rather inferior, so this machine caused us frequent trouble and it was necessary to keep the hand generators on the switchboard in good condition at all times.

BE TRUE TO THYSELF

I am not bound to win, but I am bound to be true.

I am not bound to succeed, but I am bound to live by the light that I have.

I must stand with anybody that stands right, stand with him while he is right, and part with him when he goes wrong.

—ABRAHAM LINCOLN.

Our next machine was the Butler-Lane, then manufactured at David City, Neb. As far as ringing machines were concerned we considered that perfection indeed. It was really a fine little machine and would operate continuously for days with practically no attention.

This machine was in reality a rotary pole-changer, for it consisted of a small motor which operated from the 24-volt exchange battery and turned a commutator that interrupted the same exchange battery at the proper frequency. This alternating current was then stepped-up to the proper voltage for ringing substation bells, by a suitable transformer. I have no doubt that many of these machines are in operation and giving good service today.

We next advanced or changed to the ringing dynamotors which consisted of a double-wound armature rotating in a single field. The field and one of the armature windings were usually energized with the 24-volt exchange battery. The second winding was wound to produce 75 to 90 volts at 16 cycles. This type of machine was often used for reserve power or, as we referred to it, a "standby machine."

Our next change was to the so-called motor magneto. This consisted of a motor operated from the commercial power which turned a specially-designed magneto at the proper speed. The magneto was first connected to the motor by a flat belt and later direct-connected by a shaft with a flexible coupling.

The first one of these that we used was made-up locally by replacing the crank on a hand generator with a suitable pulley, and belting a motor to it. This proved fairly successful except for the fact that the bearings on the hand generator would not last long under continuous operation. Machines of the motor magneto type are still being manufactured in various sizes and are entirely satisfactory.

Our next advance was to the ringing generator, which is still used in practically all large exchanges. They may be either direct or belt-connected to the driving motor, although nowadays they are usually the former.

These ringing generators deliver 90-volts at 20 cycles, alternating and pulsating currents and also several tone frequencies. Often a worm gear on one end of the armature shaft drives a large commutator which gives different interrupter frequencies for use on manual feature and automatic switchboards. Although the ringing generator has practically been adopted as standard for the larger exchanges, remarkable strides have been made in the development of ringing converters for use on the small and medium-sized systems.

The various types of modern converters all operate on practically the same principle. They all consist essentially of a low-resistance motor magnet which vibrates a spring arm in a manner similar to the clapper on a vibrating bell. The end of this arm is equipped with contacts which alternately place battery on opposite sides of the line.

Formerly these vibrators were all designed for operation from the exchange battery or from dry cells, although for the past several years they have been modified so as to operate from 60-cycle commercial current.

The alternating current is converted to direct by some type of rectifier, usually of the vibrating, electron tube or copper-oxide type. One type of converter does not use a rectifier of any kind. It employs a single vibrating reed which alone changes the commercial frequency to one suitable for ringing substation bells.

This machine is simply an impulse selector, in that it selects certain of the

input impulses, resulting in an output current consisting of true 60-cycle sine waves, on a 20-cycle time axis. To obtain this result, only one contact is necessary, and as it makes and breaks at zero potential, there can be no arcing and, consequently, no contact depreciation due to that cause.

Improved contact metal has greatly increased the reliability of the modern converter, and now large numbers of them are in daily operation in small and medium-sized exchanges, giving good reliable service.

A ringing machine recently developed and which has attracted considerable attention is a static frequency converter which produces telephone ringing current from commercial alternating power supply without moving parts.

The basic principle on which this converter operates is that of an oscillating circuit tuned to 20 cycles. The oscillations are initiated by the operation of a switch, which in this case is actuated by a relay. The output frequency is always one-third that of the input frequency regardless of the fluctuations in the power supply.

So that is about all we remember about ringing machines, past and present. As to future changes in telephone equipment, we may only speculate, but no doubt ringing equipment will continue to change along with everything else, as time marches on.

The Operators' Corner

By MRS. MAYME WORKMAN

Traffic Supervisor, The Illinois Telephone Association, Springfield, Ill.

A SHORT time ago the writer spent the night in a small town in the southern part of Illinois. In walking down the street to the corner restaurant for breakfast, it was a pleasant experience to be greeted with a friendly "Good morning" by every man, woman and child along the way. The quiet and peace of the village, the sincere spirit of friendliness of the natives and the beauty of the rustic surroundings left a lasting imprint upon the writer's memory.

In metropolitan areas most people go to work at the same time every day. They see almost the same faces day after day. Frequently, people travel with each other for years, often sitting in the same seat, and in some cases getting off and on at the same street; yet never a word do they speak to each other. What a contrast to the friendly atmosphere of the small towns and rural communities!

Friendliness is one of the most admirable characteristics of the human race. People in small towns and villages take for granted that one's fellow man is worthy of friendship. Friendliness is a very valuable asset to anyone, whether in the country or the city. Some people are naturally friendly while others must cultivate a spirit of friendliness.

Bronson Alcott wrote that a friendship formed in childhood might become the guiding genius of one's life, and this is equally true of friendships formed at any time in life. We should add to our chain of friendship as we advance through the years. Friends are lost along the way, and if we have failed to add new links to our chain of friendship, our declining years will be spent in loneliness.

THE TELEPHONE is an invaluable aid in keeping friendships alive. It saves time and energy. Series No. 250

How often when a man or woman has reached the retirement age they are bewildered and afraid of the lonely days ahead! What to do with time on their hands? In their busy life they have neglected to form those friendships which could be a solace and comfort in their old age. Now that they are free from their daily routine work and have the opportunity to play and enjoy life, they are unhappy because they have no playmates.

It is true, we must expend a great deal of time and energy in order to be successful in the business world, but we should always reserve time for cultivating those friendships which will become more valuable and more dear to us when our duties in the business world have been consummated.

So much of the pleasure of life is derived from sharing our joys and possessions with our friends. How empty life would be if we had no one to rejoice with us at the good fortune which comes our way!

In this age of speed, when our lives are so full and time is pressing, there is a helpful little agent which can keep our friendships alive —the telephone. Through this medium we may enjoy a friendly chat with an old neighbor on the other side of town, with an aged aunt in the country, an old schoolmate in a nearby town or a friend we have made recently, when a personal call would be impossible. The telephone can be our ambassador of good will and will keep alive our friendships which otherwise might sink into oblivion through neglect, lack of time or energy.

How often we hear an expression something like this: "I really should go to see Mary. She has not been feeling well lately, but I am so tired when my day's work is ended that I just want to get home and rest."

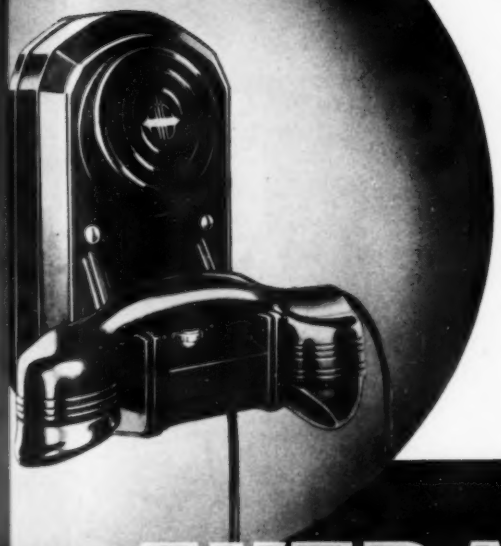
We may not have an hour or two to devote to a friendly visit, but we can sit in our favorite easy chair, reach for the telephone, call Mary and let her know we have not forgotten her. Next to a personal call, there is nothing as satisfying as a visit by telephone, hearing the voices of our friends and loved ones, exchanging friendly greetings and discussing the news of the day.

In this era of modern conveniences, no home is truly modern without a telephone. Urge your friends and acquaintances to enjoy the pleasure, comfort and convenience this little instrument affords.

Questions from Illinois Operators

1. Why is it necessary to ring a full two-second ring on toll circuits?
2. If a call has not been canceled and you are ready with the called party and the calling party does not answer, will there be a report charge?
3. Should a ticket bearing a report charge be used a second day if no arrangements have been made to carry it forward?
4. If La Salle rings the number at Peru, which rate would be used?
5. Just what reports do you put on the face of the ticket?

The answers to these traffic questions are presented on page 28.



At Left: The Type 35A5 Wall-Mounting Monophone for manual, central battery operation. Now made available to any of your magneto subscribers through use of adapter described below.

At Right: The Type 34A3 Self-Contained Desk Monophone. Both this and the wall-mounting type are completely self-contained—requiring no bell box.

EXTRA REVENUE

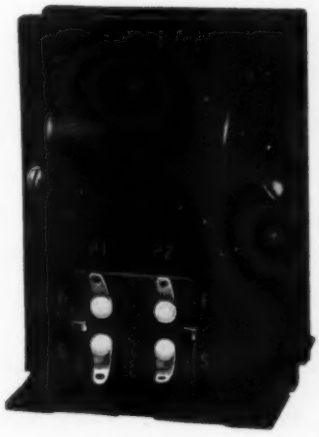
From Your Magneto Lines

You can now offer these handsome central battery Monophones to your magneto exchange subscribers at very small cost over your present method. Companies that are using this "extra revenue" service are finding it productive of substantial profit.

This new service is made possible by the Automatic Electric "Central Battery Line Adapter*"—a simple, compact device which is merely inserted in any line at the central office to convert it to central battery operation. It can be applied either to individual lines or metallic party lines up to ten stations. A small 24-volt storage battery furnishes the required talking battery.

Many of your subscribers will be glad to pay for the extra convenience of central battery operation. The small investment required will pay big dividends in added rental charges. Let us show you in actual figures the increased returns which you may expect. Write TODAY for full particulars.

* Patented in U. S. A.



The Automatic Electric Central Battery Line Adapter. Applicable to any metallic line serving up to 10 stations.

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Telephone, Communication and Signaling Products

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AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 W. Van Buren St., Chicago

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Use This NATIONWIDE SUPPLY SERVICE

For Quick Action, Proved Products, Rock Bottom Prices *and* Intelligent Analysis of Your Needs

When our salesmen tell of our four strategically-located, completely-stocked warehouses, permitting rush service to every point in the United States—that's only part of our "supply" story! The picture isn't complete until you actually try us out with an order, and find out for yourself the three other component elements which go to make up our service —and which are just as important to your ultimate satisfaction.

These are—intelligent analysis of your needs by experienced telephone men on duty at each of our warehouses —proved products of known reliability, manufactured by established, well-known firms—and last, but not least, rock-bottom prices, as compared with competitive goods of similar quality.

These three elements, together with "speedy service for every order," form a four-square foundation upon which we have built one of the largest and fastest-growing supply businesses in the telephone industry today. Now, as always, our aim is—permanently satisfied customers. Will you be one of them?

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284 King Street West, Toronto

Meeting the Traffic Problems Of a Fast-Growing Company

By A. B. WRIGHT

Auditor and Commercial Manager, Warren (Ohio) Telephone Co.

THE SUCCESSFUL handling of the traffic problems of the Warren (Ohio) Telephone Co. is best attested by the fact that its net subscriber station gain in 1934 was 10.6 per cent and in 1935, 10 per cent. This interesting paper on the three-fold responsibility of a company—to its customers, its employes and to its investors—was presented at the traffic conference held in conjunction with the recent Ohio convention

ANY TELEPHONE Company has a three-fold responsibility: 1, to its customers; 2, to its employes, and 3, to its investors.

If a company expects to be well managed and wants to succeed in its service field, department heads and their subordinates must keep in mind these three responsibilities in all their dealings and decisions. The lower down in the organization that this three-fold responsibility is felt, the more efficient and successful becomes the company in its operations.

Customers (both regular subscribers and occasional patrons of local and long distance public stations) are entitled to the best in prompt, accurate and courteous attention to all requirements which may rightly be classed as telephone business. This begins with careful attention to the order for service, a reasonably prompt installation made in a careful and neat manner, accurate entries in all records efficient traffic service by operators both as regards promptness and accuracy, proper maintenance of line and instrument, the careful preparation of the monthly bill, its prompt collection, etc.

Employes naturally are divided into two groups—managing employes and working employes. Managing employes are required to see that workers are accorded fair treatment and are trained to serve well the service-consuming group. Both divisions of employes have their responsibility to see that the owner group has a square deal.

The management employes have probably the heavier responsibility, as they must outline policies that will help workers in carrying on their work. Still the responsibility of the worker is no less important, as he or she gives the detail service day in and day out.

It is, perhaps, unnecessary in this brief outline to detail every phase of work or responsibility, but think and consider any plan or piece of work undertaken by a company as a rightful duty and try to assign that duty or decision to any or all of the responsibilities mentioned before. Try to decide whose interests are being served. The ideal situation is equal attention to all three duties.

The closer cooperation obtainable between these three groups vitally interested in telephone service, the better are the results for all concerned. This is especially true in a fast-growing company such as the one represented in this discussion—the Warren Telephone Co., Warren, Ohio.

One of our department heads, in discussing recently with an employe group a request for higher wages, frankly said to them:

> You have been taken care of in good shape in the past two years and are being paid a good wage. The customers of this company are getting what they went after in the shape of lower service rates and a refund of certain increased rates collected under bond. The next group to be served are the stockholders.
>
> Until we get back to a dividend-paying basis and make some return on stockholders' investments, increased monetary considerations to employe groups and customers should rightfully be withheld.

This was a just decision and one which all supervisory employes in all departments should keep in mind. The interests of all groups—customers, employes, and stockholders—should be conserved and evenly balanced, as all are entitled to consideration.

Sometimes it happens—in the strict drawing of lines between departments of larger companies—that information regarding revenues, expense accounts and capital expenditures are kept closely guarded within the management, executive and auditing departments, and other department heads are not informed fully regarding performance based principally on their recommendations.

I wish to set forth an example of this in a fast-growing company: During 1934 Warren gained 820 stations, a net gain of 10.6 per cent for the year. During 1935 we gained 855 stations, a net gain for the year of 10 per cent.

Local traffic increased 19.4 per cent in total local calls handled during 1934. In 1933 over 15,000,000 calls were handled; in 1934, over 18,000,000.

During 1935 the increase in local traffic was 11.9 per cent, with more than 20,000,000 calls handled.

Toll calls completed increased during 1934 19.6 per cent and 10.4 per cent during 1935.

The traffic man and chief operator increase their forces, from time to time, depending on the increase in units handled. But, if costs of service are not available for study, there is no check on other features of expense (such as the hiring of experienced people at higher rates and the indiscriminate hiring of auxiliary employes) as well as other items that creep in, to increase traffic costs.

It is a great help to traffic men and chief operators to have available information as to varying traffic expense accounts. Account control by all department heads helps to keep tendencies in all lines on an even keel. This is a part of management responsibility, but assistance in all departments can be rendered our general managers in controlling department expense accounts and capital expenditures to keep in step with revenues, as they vary in pace from time to time.

This is our duty to the stockholders whose money we use to handle our business. If we do not all feel our share of responsibility for this control, we are not properly serving the interests of stockholders. If the company does not pay stockholders a reasonable return for the use of money, that important support will not continue to be available.

Proper Personnel for Operating Force

What we shall stress here is the traffic department employe, or the operator, whose work is sometimes minimized. We shall start with employment conditions; the importance of the selection of a proper personnel for an operating force can not be over-emphasized. In our opinion every applicant should be interviewed by two company representatives, in addition to the examination by the company doctor.

One, possibly the manager or traffic superintendent, should check the other —the chief operator—on qualifications of the applicant for the position. References should also be carefully checked. Employment conditions and working requirements should be carefully explained to the applicant.

When the new operator has been selected the coach should take her in hand for training. By non-technical methods, the arrangement of the equipment to be operated should be explained to her. Gradually by listening-in with experienced employes and later by operating slowly under the supervision of the coach, supervisor or the chief operator, she becomes familiar with the work.

Too much speed should not be allowed, and new girls must be watched, particularly at the point in their careers where they begin to display confidence. Then is when errors and careless operating irregularities begin to form into habits. Within two or three months, supervisory people should be able to judge whether the student will make good. If the decision is to the contrary, she should be dropped at once before more money is spent on training.

Advanced training should always be in progress with new and older people. Chief operators should know who of their operators they have in mind for future supervisory positions. The senior members of the force must be considered first. If they are not qualified for advancement, they should know why they are passed up. A seniority list is handy at all times.

Training begins all over when a girl is selected for advancement for supervisory or clerical work. Work between departments is important and it is well to have people trained to step temporarily into an emergency job in another department. Preference of work hours depends entirely on length of service, younger ones taking less desirable tours as soon as they are able to work alone. They gradually work up to better hours as they remain in service.

If there are not sufficient experienced operators to balance the force on efficiency during late evening hours, older and more experienced people should be assigned to help an otherwise weak force during less desirable hours.

Loyalty must be a primary quality of operating people. Availability at times when not scheduled to work if and when an emergency arises is also important.

The story is told of a man and a girl waiting in a blizzard for a bus to take them to work. The man said finally: "This is too much; I am going back home and transact my business today by telephone." The girl replied, "I can't—I'm a telephone operator." She realized her responsibility for increased demands on the service that day.

Storms, floods, fires, epidemics, days before holidays, etc., cause traffic in exchanges to peak suddenly. As an example Warren, on the afternooon of a serious hotel fire, experienced an hourly load of 8,624 calls or 90 per cent above normal for that hour, and the toll load increased correspondingly. The day before last New Year's Day local calls increased 26.6 per cent. Toll completion increased 26 per cent.

Spring Floods Taxed Telephone Facilities

On the day of the more recent Johnstown and Pittsburgh floods, local traffic peaked 40.8 per cent and toll calls completed 59.6 per cent above normal; 200 or more toll calls were not completed that day due to service being out at destination points.

Subscribers with relatives and friends in Pennsylvania were frantic although it did not occur to them that others were just as excited and all were crowding facilities and loading operators with more calls than could be efficiently handled. This is, of course, just an example of conditions throughout the flooded area and adjacent states.

The consuming public will enter a crowded store or shop and realize that they have to wait in line for service. In the use of their telephones, being unable to see our crowd of waiters for service, the tendency is to misunderstand and, therefore, to grumble. The customer has his rights, however, dependent on his need, and is wrong in a small percentage of cases only.

We should keep in mind that, when other services fail, we are expected to serve in a greater degree. During recent emergencies, when we have had to increase our force for certain days and hours, we have relied on former operators who were willing to come in and help on a temporary basis. This has been a great aid, not only in giving adequate service during the emergency but also in keeping our regular girls on their own tours and not requiring overtime work.

A worker serves his or her customer best, who follows his or her supervisor's directions most closely, and thus the stockholder's interests are also conserved.

Commend Deserving Employes

Managing employes should not fail to compliment their forces for good pieces of work done. To be sure, we may argue that they are paid well for it. A little human touch in the shape of kind words for extra effort goes a long way and helps spread the "Spirit of Service' which we stress. Let's repeat "Spirit of Service"—to customer, management and stockholder.

▼ ▼

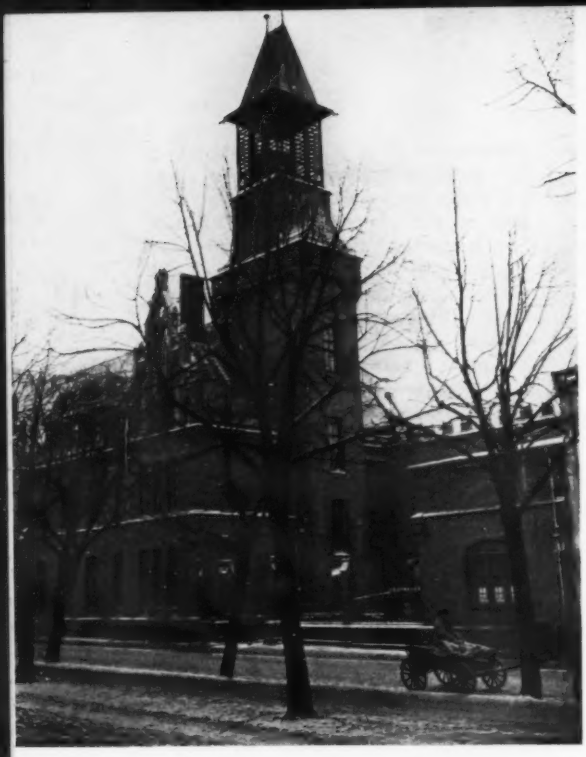
Law Convention to Discuss Utility Regulation

Regulation in various phases will occupy the program of the section on public utility law at the convention of the American Bar Association, to be held in Boston, Mass., August 25 and 26, under the chairmanship of George R. Grant, general attorney of the New England Telephone & Telegraph Co. The meetings will be held at the Hotel Statler, and the detailed program follows:

At the first session, to be held the morning of August 25, John J. Murray, chairman of the Massachusetts Department of Public Utilities, will deliver the address of welcome.

"Legal Aspects of Government Regulation of Prices in Industry" will be discussed by George R. Grant. The afternoon's program features will include discussions on "Title I of the Public Utility Act of 1935," by Robert E. Healy, member of the Securities and Exchange Commission; "Relation of Federal and State Commissions Under the Public Utility Act of 1935," by Henry G. Wells; and "Title 2 of Public Utility Act of 1935," by Clyde L. Seavey, member, Federal Power Commission.

"Massachusetts Regulation of Public Utilities" will be discussed at the last session of the utility regulation session, on the morning of August 26, by Commissioner Henry C. Attwill, Massachusetts Department of Public Utilities. "Competition as a Factor and Motif in Transportation Regulation" is the subject of a special committee report, to be made by J. Carter Fort, general solicitor for the Association of American Railroads.



Central Office Building at Klaipeda, Lithuania. The Aerial Distribution Standard Visible in the Tower Is No Longer Used Since All Wires Entering the Exchange Have Been Placed in Underground Cables.

Klaipeda, Lithuania, Now Served by Modern Equipment

By W. G. TAYLOR

Automatic Electric Co., Ltd., Strowger Works, Liverpool, England

A MODERN communication service, marking the first step in the rehabilitation of Lithuania's telephone system, became available to the citizens of Klaipeda on December 1, 1935, when the new Strowger automatic telephone exchange was brought into service. After months of preparation, which included additions and alterations to the external plant, the cutover was successfully effected during the night of November 30.

Lithuania was confronted by many urgent problems arising from its postwar autonomy, and the successful completion of various reconstruction schemes sets an example to many larger and less encumbered countries. Steadfast patriotism and determination to improve conditions of living for the inhabitants is shown by the comprehensive program of public works undertaken by the administration.

Reconstruction has proceeded in accordance with a well-devised plan to provide for the nation's needs in order of urgency and as finance could be arranged.

Rehabilitation of the country's communication systems was naturally a need of prime importance and the work has proceeded in an orderly manner. Road, railway and harbor works were first given attention, then telephones and telegraphs were considered.

A decision having been made to adopt the Strowger automatic system, negotiations were opened with one of the foremost British telephone manufacturers with the result that on November 21, 1933, an agreement was concluded between the Minister of Communications—authorized by the Cabinet of Ministers—and Automatic Electric Co., Ltd., Strowger Works, Liverpool, England, whereby the first step in the reconstruction of the telephone system was taken.

Naturally, priority was given to the centers of commercial activity. Consequently the first installations of automatic telephone equipment were projected for Kaunas, the capital, and Klaipeda, the chief port of the country. Owing to the existence of suitable building accommodations, the Klaipeda installation was proceeded with first and 3,000 lines of equipment with associated manual trunk boards were put into operation on December 1, 1935.

Concurrently the Ministry undertook the construction of a magnificent new postal building in Kaunas where 7,500 lines of equipment will eventually be put into service, together with an associated satellite exchange in the suburb of Sanciai with 700 lines provided.

The agreement also covered the supply of suitable external cable for the reconstruction of the subscribers' networks, the task of installing this cable being undertaken by the Ministry.

The Klaipeda automatic equipment provides circuits for 3,000 lines. It operates on the finder principle with Strowger 200-point, two-motion finder switches employing partial secondary trunking. Subscribers' meters are provided for 3,000 lines, to operate for local metering only at present, but later may be converted to zone metering. A line I. D. F. is provided to even out the traffic in the various groups of lines.

The switches provided comprise:

Line finders.	270.
Secondary finders.	50.
10/20 first selectors.	155.
10/20 second selectors.	171.
Special service selectors.	9.
200 p. t. final selectors. (connectors).	270.
Toll selectors. (for night service).	5.
Test distributors.	3.

The final selectors include three groups for P. B. X. lines, also special finals for toll working and testing.

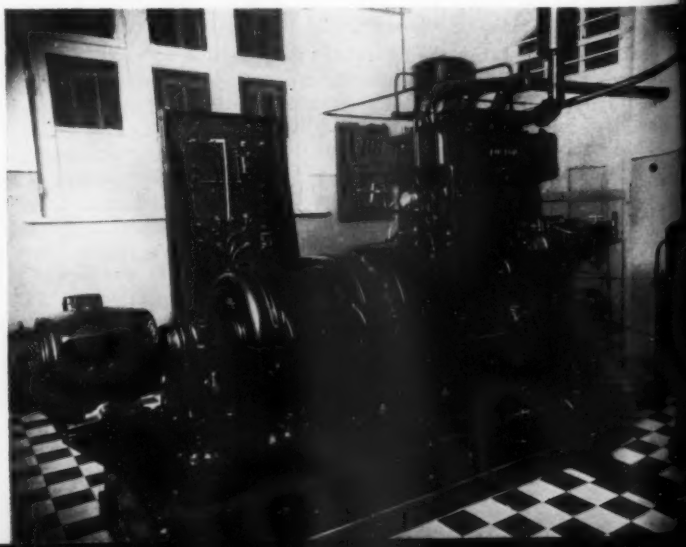
The power plant comprises:

Two batteries, each of 25 cells with plates for 1,240 ampere-hours in boxes for 2,015 ampere-hours.

Two motor-generator sets giving 275 amperes at 57 volts.

Two ringing machines, one mains and one battery-driven.

One 30-kilowatt engine-driven generator set at standby, which generates at



Standby Engine-Driven Generator in the Klaipeda Telephone Exchange.

The Old Klaipeda Switchboard Which Was Recently Replaced With Strowger Automatic Equipment.

380 volts, three-phase, 50 cycles, so that in case of failure of the mains supply, the motor generators and the central office lighting circuits may be supplied from the engine set.

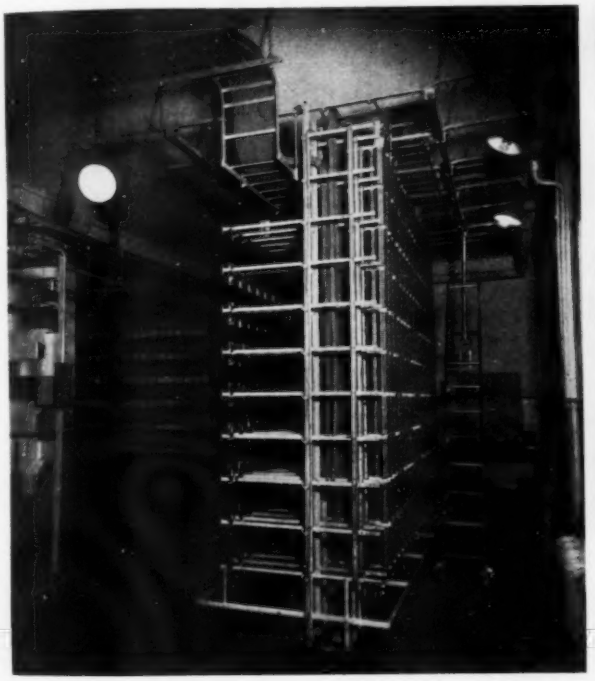
The toll and other associated manual equipment comprises: Twelve-position toll board; two-position aviso board; two-position record table; two-position combined information and complaints desk; one-position supervisor's desk; one-position test desk and repair bench, and one toll test rack.

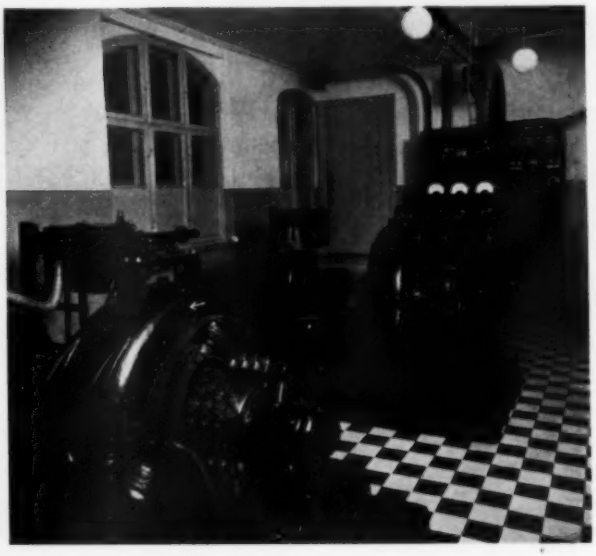
The cord circuit apparatus of the toll and aviso positions is mounted on separate racks, which makes for convenience in maintenance. As a precaut'on against lightning damage, the toll lines are first brought in through a special rack equipped with vacuum type arresters in addition to protectors.

Toll calls are offered and connected to the local subscribers by means of an aviso board upon which appears a full multiple of all subscribers' lines. Operation of this aviso board is by order-wire working from the toll positions.

Special toll connectors are available to the toll operators by which toll calls can be offered and connection directly established from selected positions upon which night concentration is effected. By this means, operating economy is possible in that the aviso operators are dispensed with.

From the foregoing brief description it will be evident that Klaipeda has a modern telephone system which should prove of inestimable value to the inhabitants for business and social purposes.





The View to the Left Shows the Main Distributing Frame in Klaipeda's New 3,000-Line Automatic Exchange. The Other Illustration Shows the Motor Generator.

Final Selectors in the Strowger Automatic Exchange Installed Recently in Klaipeda, the Chief Seaport of the Small But Progressive Country of Lithuania.

Three-Position P.B.X. for Lincoln, Neb., Store

The Lincoln Telephone & Telegraph Co. of Lincoln, Neb., recently completed the second three-position switchboard ever installed for subscribers in its territory and the first one in nine years. It will serve the demands of Gold & Co., one of the largest department stores in Lincoln. The store, it was found by a preliminary survey, had a daily average of 1,066 incoming, 1,012 outgoing and 714 interconnecting calls, with an estimated peak load of 4,000 calls.

The new switchboard is a full multiple unit, equipped with 21 trunks, 96 stations and one extension, with expansion possible to 40 trunks.

TOLL ADVERTISING TAKES NO VACATION

While the rest of the world is on vacation, toll advertising continues to work hard. The advertisement on the opposite page, appearing in general magazines during July and August, suggests a number of uses for toll service. Consistent advertising of this character should help to stimulate traffic throughout the entire telephone industry.

AN ADVERTISEMENT OF THE BELL TELEPHONE SYSTEM

Hours TO GET TO VACATIONLAND
Before you start, telephone ahead for reservations. After you arrive, telephone home—to tell friends about your trip—to take care of forgotten errands.
And later, call them often—to get the latest news, invite them for the week-end, tell them what you're doing.
It's quick, convenient, inexpensive. Rates for station-to-station and person-to-person calls to most points are lower after 7 every evening and all day Sunday. Keep in touch with family and friends . . . by telephone.
Minutes TO REACH HOME

Financial Operating News and Data

General Telephone Corp. Reports Upturn for 1935

General Telephone Corp., created by the reorganization of Associated Telephone Utilities Co., May 13, 1935, recently presented its first annual report, showing net income of $985,950 for the full year 1935, excluding General Telephone Allied Corp. This is a reduction from the preliminary figure of $999,345, and compares with $900,122 for the predecessor company in 1934.

Current assets for the corporation and subsidiaries, excluding General Telephone Allied Corp., amounted to $9,654,687 on December 31, 1935, including cash of $7,521,758, against current liabilities of $1,851,369. This compares with $9,967,260 in current assets, including cash of $4,775,705, and current liabilities of $2,947,681 for the predecessor company.

▼ ▼

Annual Report of Garden Valley of Erskine, Minn.

A statement that "should cheer the heart of every stockholder," to quote the words of General Manager Thomas Vollom, has been issued by the Garden Valley Telephone Co., of Erskine, Minn., for the year of 1935. Fifteen of the company's 17 exchanges reported net profits for the year's operations and the company was able to meet all of its bills payable, amounting to $15,890.

The total operating revenues amounted to $67,490. Deducting operating expenses of $46,070 left net operating revenues of $21,420. Making additional deductions for taxes and interest left a net balance of $17,033 for depreciation and dividends. The company's assets, as of December 31, 1935, totalled $332,277. This includes a plant investment of $325,034.

General Manager Vollom reports that the value of the stock dollar is now about $2.50, a gain of 11 cents for the year. The plant and equipment account shows an increase of $14,657 over the preceding year.

▼ ▼

Bell System Earnings Best in Six Years

Net earnings of the Bell Telephone System for the three months ended May 31 were the highest in six years, covering the regular American Telephone & Telegraph Co. dividend of $2.25 a share per quarter for the first time since 1931. The net income for this period, applicable to the parent company's stock, totaled $45,196,739, equivalent to $2.42 on each share of stock, as compared with $32,153,385, or $1.72 a share for the same quarter of last year.

The condensed earnings report of the Bell Telephone System (compiled by C. A. Heiss, comptroller), consolidating the accounts of the A. T. & T. Co. and its 23 associated companies for the three months ended May 31, with comparative figures for 1935, follows:

	3 Months Ending May 31, 1936	3 Months Ending May 31, 1935
Operating revenues	$250,899,786	$232,397,768
Operating expenses‡	$165,974,375	$161,922,108
Taxes	30,081,376	24,153,178
Operating earnings	$ 54,844,035	$ 46,322,482
Other earnings—net*	6,675,000	2,650,000
Total net earnings	$ 61,519,035	$ 48,972,482
Interest deductions	12,554,809	13,272,455
Net income	$ 48,964,226	$ 35,700,027
Dividends on preferred stocks of associated telephone companies held directly by public	$ 1,579,970	$ 1,606,270
Net income applicable to common stocks of associated telephone companies held directly by public	2,187,517	1,940,372
Net income applicable to A. T. & T. Co. stock	45,196,739	32,153,385
Per share—A. T. & T. Co. stock	$2.42	$1.72

‡Includes current maintenance, depreciation, traffic, commercial, general and miscellaneous expenses and operating rents.

*Includes proportionate interest in earnings or deficits (partly estimated) of controlled companies not consolidated, including Western Electric Co.

President Walter S. Gifford, in a report to stockholders under date of July 15, states that the Bell System gained 385,000 telephones during the first six months of the year, as compared with 201,000 in the first half of 1935. Toll and long distance calls increased 12.8 per cent in the same period.

Below is presented the earnings report of the American Telephone & Telegraph Co. for the three months ended May 31, with comparative statistics for 1935:

	3 Months Ending June 30, 1936*	3 Months Ending June 30, 1935
Operating revenues	$26,249,728	$22,990,230
Operating expenses including taxes	21,438,153	19,677,926
Operating earnings	$ 4,811,575	$ 3,312,304
Dividend revenues	35,836,835	28,414,937
Interest revenues	1,773,941	2,846,296
Miscellaneous non-operating revenues—net	185,000	138,022
Total net earnings	$42,608,351	$34,711,559
Interest deductions	5,776,664	5,838,032
Net income†	$36,831,687	$28,873,527
	$42,017,890	$41,990,119
Dividends—Charged against net income	36,831,687	28,873,527
Charged against surplus	5,186,202	13,116,592
Average number of shares of capital stock outstanding	18,674,618	18,662,275
Earnings of A. T. & T. Co.—per share	$1.97	$1.55

*Subject to minor changes when final figures for June are available.

†Does not include the company's proportionate interest in the undivided profits or deficits of subsidiary companies.

The earnings of the A. T. & T. Co. for the quarter ended June 30 reflect the receipt of a dividend of 50 cents per share from the Western Electric Co., Inc., the first dividend paid by that company since June, 1931.

▼ ▼

Southwestern Bell Report Shows Improved Conditions

Improvement in service, fewer interruptions because of equipment failures, improved business office procedure, a net increase of 46,600 telephones and an increase of 7 per cent in long distance calls. These are the accomplishments to which attention is directed in the annual report of the Southwestern Bell Telephone Co. for the year ended December 31, 1935.

A. B. Elias, president of the company, in his analysis of the past year's operations, reports that all of the basic in-

dustries in the area served by the Southwestern Bell registered gains over the previous year. Agricultural income, he said, was the largest in five years. In keeping with the general business trend, the Southwestern Bell experienced for the second year in succession a net increase in telephones. It closed the year 1935 with 1,234,229 telephones in service, a gain of 46,600 as compared with a gain of 43,904 in 1934.

The company has thus recovered 44 per cent of the subscribers lost during the depression. The total number of long distance calls for 1935, however, is only 28 per cent under the figure for 1929.

New construction undertaken during 1935 included the first new buildings and central office equipment installations of any consequence in several years. An increase was seen, too, in the extension of facilities to newly-opened city and suburban residential sections.

The 1935 balance sheet shows total assets of $410,042,641, an increase of $50,275,876 over the preceding year. The assets include: Telephone plant, $328,044,426; miscellaneous physical property, $1,024,073; investment in controlled companies, $4,357,978; other investments, $8,190,780; sinking and other reserved funds, $44,250,000; current assets, $20,268,123; deferred debits, $3,907,261.

The liabilities, which total $410,042,641, include: Capital stock, $194,786,416; total funded debt, $92,975,600; current and accrued liabilities, $16,058,847; deferred credits and miscellaneous reserve, $91,686; depreciation reserve, $78,416,113; surplus reserved, $3,403,405; unappropriated surplus, $16,423,955.

The 1935 income statement shows total operating revenues of $73,594,577, made up of these items: Local service revenues, $48,588,258; toll service revenues, $21,540,050; miscellaneous revenues, $3,746,371. From the total of these items was deducted $280,103 for uncollectibles.

The total operating expenses of $48,622,175, are comprised of: Current maintenance, $12,251,705; depreciation expense, $13,122,671; traffic, $10,548,107; commercial, $5,654,713; operating rents, $1,019,885; general and miscellaneous, $6,025,093.

From net operating revenues of $24,972,402 were deducted $68,177 for rent for lease of operating property and $8,330,331 for taxes, yielding a net operating income of $16,573,894. Adding $571,681 in non-operating income leaves an income of $17,145,575 available for fixed charges. Deducting fixed charges of $3,198,857, leaves a net income available for dividends of $13,946,717.

After paying 7 per cent dividends on the preferred stock, there was available for common stock dividends the sum of $12,421,732. In order to pay the common stock dividend, the company was required to draw upon its surplus account to the extent of $1,418,268.

A table of condensed statistics included in the annual report of the Southwestern Bell shows that the company operates 772 central offices and 6,526 private branch exchanges. Of the 1,234,229 telephones operated, 494,550 are common battery instruments, 52,121 are magneto and 687,558 are of the dial type. The residence telephones total 758,521 and business, 475,708.

Service and private line telephones total 57,529 and connecting company telephones, 558,160.

The Southwestern Bell reports that it connects with 1,597 other companies; that it maintains 45,251 miles of pole line, with 2,641,359 miles of aerial cable and 3,933,619 miles of underground wire. Of this total 791,086 miles of wire are used in toll service.

The average number of local calls per month is 254,262,648 and the average number of toll calls 3,967,302. The company's staff includes 8,038 women employes and 13,678 men employes, a total of 21,716.

Special services of the company include the operation of 749 switched teletypewriter stations, 224 private line teletypewriter stations and 143 Morse telegraph stations.

The officers and directors of the company are as follows: President, A. B. Elias; vice-presidents, A. C. Stannard, F. M. Hoag and V. M. Carroll; treasurer, G. C. Gephart; secretary, H. D. McBride, general counsel, E. H. Painter; general auditor, E. W. Meyer; directors, A. B. Elias, F. M. Hoag, R. McK. Jones, C. Nagel, E. D. Nims, G. Pantaleoni, M. E. Singleton, A. C. Stannard, E. F. Swinney and F. O. Watts.

▼ ▼

Morristown, Minn., Company Holds Annual Meeting

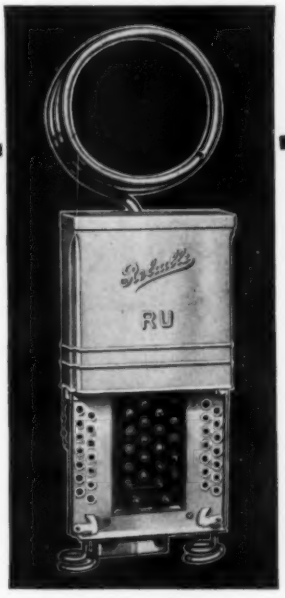
The report of the annual meeting of the Morristown Telephone Co., of Morristown, Minn., was published in a recent issue of the Morristown Press. C. D. Fausch was re-elected first vice-president for three years and Mrs. John Meehl was re-elected second vice-president.

Mr. Fausch, a graduate of a high school at Ames, Iowa, and of the Iowa Business College at Des Moines, Iowa, and for a time a student at Leander College and Iowa State College, owns and operates a large farm near Morristown. He raises pure-bred hogs and cattle and is a premier seed grower. He is president of the Rice County Productive Corp. Last year he was inspector of forage conservation work in 11 states.

Secretary Henry Seidel presented a

A DEPENDABLE

CABLE TERMINAL



Reliable RU unprotected terminals are easier to install, easier to work on and built to outlast the cable.

Write for a Sample

Reliable Electric Company

Chicago, Ill.

general report on the condition of the company. The past year, he states, has been "the toughest one." At the close of the year the company had 196 stations in service, including 115 farm stations, 58 city and 23 business stations. This compares with 229 stations in 1931, 268 in 1932, 257 in 1933, 195 in 1934.

He reports the experience of so many other companies, that a rate reduction failed to bring about the desired purpose, of retaining subscribers. From July 1, 1932, to December 31, 1933, the company gave its subscribers the benefit of a 33⅓ per cent discount in rates. Said Mr. Seidel, in commenting on the experience:

"This was on the promise that if we gave a reduction in rates we would be able to gain the subscribers back and perhaps gain more. It failed to work out, however, and some of our strongest agitators for the reduction in rates were the first to take out the telephone."

The secretary, in the newspaper report on the company's annual meeting, urged every farmer to have a telephone installed in his farm residence; if not for his own benefit or protection, it should be provided for the convenience and happiness of his wife. "Why deprive the best helpmate you have of the little luxuries in life; give her a telephone; it will cheer her up," he concludes.

▼ ▼

Lincoln (Neb.) T. & T. Co.'s 1935 Report

The Lincoln Telephone & Telegraph Co., Lincoln, Neb., has adopted the plan of substituting for the annual financial report of the company, as heretofore made by its officers, the auditing of its books yearly by certified accountants. Their report, recently filed, shows that the company had net operating revenues in 1935, deducting $11,344 for uncollectibles, of $2,586,000, made up of $1,790,596 local exchange revenues, $680,475 toll and $126,325 miscellaneous revenues.

Operating expenses were $1,938,824, divided as follows: Maintenance, $504,615; depreciation, $402,957; traffic, $362,331; commercial, $290,273; general and miscellaneous, $219,271; and taxes, $159,377. Net operating income was $647,228, and total income, $681,902; income available before federal income taxes, $673,545; fixed charges, $178,125; and net income, $486,831.

The surplus account was increased to $926,223, or nearly $101,000, whereas there has been a deficit for the preceding three years. Common stock dividends paid were $241,503, and Class A preferred, $167,423, a total of $408,927.

The company has total assets of $14,667,220, made up of plant, $12,763,519; investments, $149,387; current assets (including $362,000 cash), $996,418; other assets, $434,732; and deferred charges and prepaid expenses, $332,102. The company has $6,025,800 of stock outstanding, of which $2,575,750 is preferred and $3,450,050 common. Funded debt, $3,500,000; demand notes, payable to trustee of pension fund, $434,000; current liabilities, $448,490; depreciation reserve, $3,327,000; and surplus, $926,223.

The balance sheet of the Lincoln Telephone Securities Co., a holding company organized in 1928 by President Frank H. Woods and associates for the purpose of centralizing ownership, also submitted, shows assets of $8,475,000, the principal holding being 99 per cent of the outstanding preferred and common stock of the parent company, with total holdings of telephone securities of $8,178,501.

The Securities company has outstanding, 57,430 shares of 6 per cent preferred, 29,056 shares of Class A common and 63,006 shares of Class B common (voting stock), placed on the books at the cost price of $7,761,883. It has a surplus of $99,645.

The company had an income of $525,160 in 1935, $434,941 from dividends, $12,610 from interest, $71,663 profit from securities sold, and commissions of $1,945. Expenses were $42,426, leaving a net income of $482,734, of which $415,608 were paid in dividends. The company has the same officers and directors as the telephone company.

Answers to Traffic Questions on Page 16

1. So that the ring may go through to the distant office.
2. Yes.
3. No.
4. The rate to Peru. The rate may be the same, in some cases.
5. The reports received by the CLR operator or the operator making the first attempt on the call.

▼ ▼

Annual Report of Peoples of Butler, Pa.

The Peoples Telephone Corp., of Butler, Pa., reports a net gain of 318 stations during 1935, the second largest yearly gain in its history, second only to 1929. In the past two years the company has recovered 31 per cent of the losses sustained during 1930, 1931, 1932 and 1933. On December 31, 1935, a total of 7,256 telephones were operated by its 12 exchanges.

The analysis of the company's financial statements, as prepared by President John H. Wright for the stockholders, shows that local service revenues totaled $246,666 in 1935, an increase over 1934 of $4,786. Toll revenues totaled $43,813, an increase of $656. Operating revenues totaled $303,579, an increase of $7,914.23. Operating expenses amounted to $197,308, an increase of $2,070.

Customers' suspended accounts were $783 on December 31, 1935, compared with $2,599 on the same date in 1934. Accounts receivable totaled $2,091, as compared with $7,740 in 1934.

Operating taxes of the Peoples corporation increased $4,900.68 in the past year, over 1934, an increase of almost 67 cents per telephone in service. Mr. Wright directs attention to the fact that further progressive increases in taxes are to be expected because of recent legislation which affects the years 1936 to 1949 inclusive.

Net operating income, after deducting taxes of $22,059 and adding other income, was $84,212. Net income, after interest deductions of $36,782, was $47,831. After payment of the preferred stock dividend and a 6 per cent dividend on common stock, and making other debits to surplus, there was an unappropriated surplus of $275,131 on December 31, 1935.

The assets of the Peoples Telephone Corp., which total $1,832,135 include among other items the following: Real estate, $257,445; telephone plant and equipment, $1,344,942; general equipment and supplies, $85,865. The liabilities include: Common capital stock, $462,300; preferred stock, $230,000; funded debt, $600,000; reserve for depreciation, $206,749; unappropriated surplus, $275,131.

The president reports that by agreement with preferred stockholders, the dividend rate on that class of stock was reduced from 7 to 6 per cent, the reduced rate to become effective with dividends paid December 31, 1935. The company was also successful in selling a $600,000 refunding issue of 25-year bonds bearing 4 per cent interest to replace an issue of 6 per cent bonds, of which $606,000 were outstanding. The latter were called for retirement February 1, 1936, at 102½ and accrued interest.

The officers and executives of the company are as follows: President, John H. Wright; vice-presidents, Daniel Younkins and M. M. Heinzer; treasurer, H. W. F. Graham; secretary and general manager, A. O. Black; assistant secretary and commercial manager, R. E. Forsythe; plant superintendent, E. H. Plaisted; auditor, W. H. Cunningham; engineer, D. T. Winner. The first six named officers, together with F. A. W. Green, F. A. McClung and E. W. McGill, constitute the board of directors.

Activities of Commissions and Courts

FCC Orders Companies to Report Material Prices

Moving to gather detailed information on the activities of the telephone companies, the Federal Communications Commission, on July 20, ordered the companies under its jurisdiction to report the prices paid for new material.

▼ ▼

Handset Charge Dropped; Other New Rates

The Orange County Telephone Co., Middletown, N. Y., plans to file reductions in its rates with the New York Public Service Commission which will save subscribers of the company about $9,700 annually. The decreased charges are to be filed as the result of negotiations conducted by the commission and will result in the closing of a proceeding which the commission instituted concerning the rates of the company.

The rate reductions will become effective August 1 in the territory of the company which includes the city of Middletown and the communities of Otisville, Thompson Ridge, Bloomingburg and Wurtsboro in Orange and Sullivan counties.

The reductions are to consist of the elimination of the extra charge for handset telephones; the reduction of service connection and move charges to those which will become effective August 1 by the New York Telephone Co. in its smaller exchanges; the adoption on August 1 of the modification in intrastate toll rates up to 40 miles; and the reduction of the monthly charge for residence extension stations from 75 cents to 60 cents.

These changes, together with the reduction by the Orange County company of the minimum charge for season service to four months made early last spring, will make the charges of the Orange County company consistent in all respects with those ordered for the New York Telephone Co. effective August 1 (TELEPHONY of July 4).

The Orange County Telephone Co. filed a change in its tariffs which became effective July 1, 1935, which eliminated the handset charge of 25 cents a month after it had been paid for a two-year period. The provision was retroactive so that a subscriber, who had paid 25 cents per month for a handset for the two years prior to July 1, 1935, was not required to make further payments. When the change affecting handset rates became effective there were about 900 subscribers who were entirely relieved of the charge.

Now the handset charge is eliminated for all subscribers and a report approved by the commission points out that the Orange County company is the first in the state to agree to the elimination of any additional charge for handsets and is the first Independent company to express its willingness to adopt a lower schedule of toll rates for distances up to 40 miles. The commission instituted an investigation of the rates of the company after the handset charge was eliminated for those who had paid the extra charge for a two-year period on July 1, 1935.

Reductions were made in the telephone rates of the Orange County company effective on January 1, 1933, which were estimated to have saved subscribers about $6,000 a year and which brought about reduced rates for one-half of the company's subscribers. All but 100 of the company's 5,600 subscribers pay rates from 25 cents to 50 cents per month less than the New York Telephone Co. rates.

The elimination of the extra charge for handset telephones is estimated to save the 1,700 subscribers using handsets about $5,200 a year. The changes in rates involves the establishment of a $1.00 substitution charge which is the same amount as charged by the New York Telephone Co. for substituting instruments in exchanges of similar size. The revision of the service connection charges will save subscribers about $1,000 annually.

The charge applying to new or additional facilities for residence service is reduced from $3.00 to $2.00. For extensions and P. B. X. stations the charge is reduced from $2.00 to $1.50 for business service and from $2.00 to $1.00 for residence service. The $1.00 charge applying to facilities already installed and taken over without lapse of service is discontinued. The move charge for changing the location of equipment within the same building or residence is reduced from $2.00 to $1.00.

The introduction of the short-haul toll rates for distances up to 40 miles is estimated to save telephone users $3,000 annually and will be the same as those to become effective August 1 in the territory of the New York Telephone Co. in compliance with a recent

ROEBLING
electrical
Wire & Cable

Paper Insulated and Leaded Telephone Cable... 150 Pairs

Telephone Cable... Paper Insulated and Leaded.

★

Telephone Switchboard Cable ... Silk and Cotton Insulated and Leaded.

★

Twisted Pair and Parallel Telephone Wire... Rubber Insulated and Braided (bronze, copper, iron, and copper-weld).

★

Bare Copper and Bronze Wire.

★

Bare Galvanized Steel Wire.

★

Galvanized Steel Strand.

JOHN A. ROEBLING'S SONS CO.
TRENTON, N.J.
Branches in other cities

ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING

Fig. 5 illustrates a typical *complaint ticket* used in entering subscribers' complaints. It is aptly termed a "trouble ticket" and needs no further description.

As soon as trouble ticket is made out by an operator, it is turned over to the wire chief. At the time the trouble

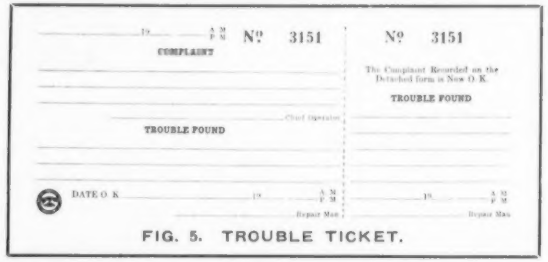


FIG. 5. TROUBLE TICKET.

ticket is made out, the same information is listed on a complaint record (Fig. 6). When the fault complained of is cleared, the troubleman promptly reports this fact to the chief operator who then enters the date and time the trouble was cleared.

Each day the record of the previous day is scanned by the chief operator. All complaints not taken care of are copied on another sheet of the complaint record with a nota-

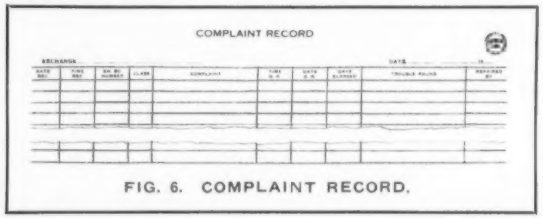


FIG. 6. COMPLAINT RECORD.

tion that these items were carried over from the preceding day. The first copy is then sent to the wire chief who enters the nature of the trouble found and the name of the person making the repair. By strict attention to the foregoing routine, subscribers' complaints are seldom overlooked.

Other Records—The Farm Line Map

Other records which add to the efficiency of the wire chief's work are the subscriber's record card and the toll line record.

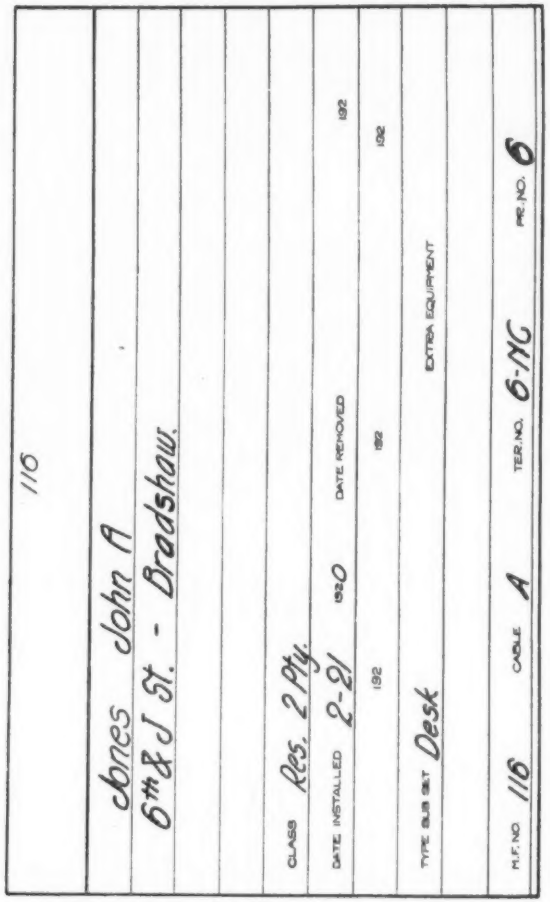


FIG. 7. SUBSCRIBER'S RECORD CARD.

The subscriber's record card shown in Fig. 7 is really a combined commercial and plant department record. A card is made out for each subscriber and kept up to date. It is a permanent record containing in addition to the name

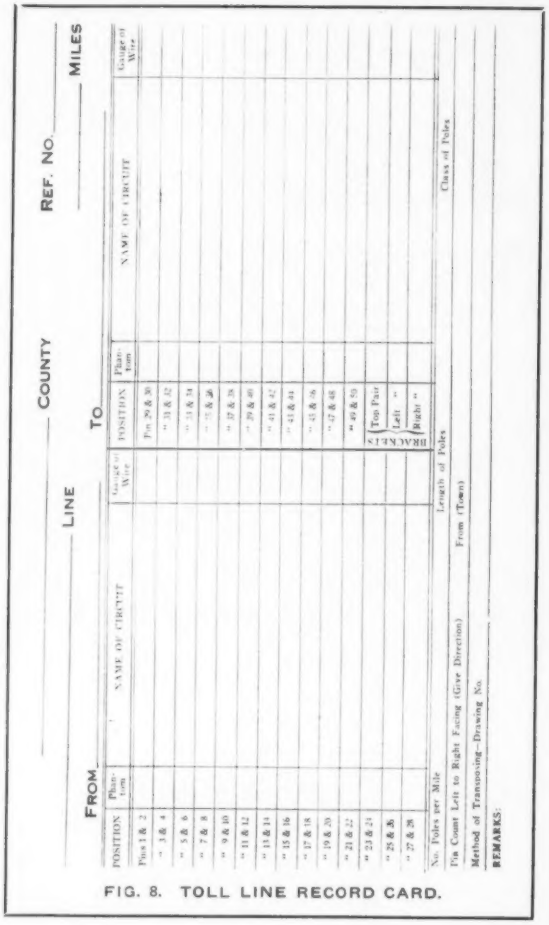


FIG. 8. TOLL LINE RECORD CARD.

and the address of the subscriber, the loop resistance and normal line tests of the subscriber's circuit for comparison with voltmeter readings in detecting potential cases of trouble such as high resistance joints.

order of the commission (TELEPHONY of July 4). A comparison of the present and the new short-haul toll rates is given in the following schedules:

PRESENT RATES

Station to Station

Miles	Day Rates
0 — 6	10 cents
6 — 12	15 cents
12 — 18	20 cents
18 — 24	25 cents
24 — 32	30 cents
32 — 40	35 cents

NEW RATES

Station to Station

Miles	Day Rates
0 — 8	10 cents
8 — 16	15 cents
16 — 22	20 cents
22 — 28	25 cents
28 — 34	30 cents
34 — 40	35 cents

The reduction in the rate for residence extensions from 75 cents to 60 cents per month will save subscribers about $500 a year. The $1.00 charge for business service extension stations remains unchanged.

▼ ▼

Company Cannot Contract Against Liability, Says Court

No public utility may contract against liability for its own negligence, Judge Ralph Sugrue ruled recently in Common Pleas Court in passing upon the demurrer of Dr. Daniel Quilter, chiropractor of Tiffin, to a defense of the Ohio Bell Telephone Co. in his $35,000 damage suit. Dr. Quilter claims damages against the Ohio Bell company on the grounds that an error in an advertisement in the Tiffin telephone directory cost him his license. He charges dropping of the "t" in the "Mt. D.", abbreviation for Doctor of Mechanotherapy, in his advertisement caused the state medical board to withdraw his license.

In its defense, the Ohio Bell company declared that rules filed with the state public utilities commission contain a clause specifically exempting the company from liability for errors or omissions in its directories.

No cases involving this issue have been passed upon by the courts, said Judge Sugrue, who held that, while rules filed with the commission become a contract between the utility and commission for the benefit of a third party —the public—provisions of such a contract may not be against public policy.

Declaring a clause exempting the company from liability is clearly not beneficial to subscribers and is against public policy, Judge Sugrue said no rule of law permits a utility to take away rights of one person to effect a saving for another; and that it cannot be argued that if the company is absolved from responding in damages to its patrons in such cases, the cost of service can be reduced.

"Upon sound public policy," Judge Sugrue held, "no person and certainly no public utility may contract against liability for its own negligence." The public utilities commission may establish rules, he said, "yet in no sense of the word has it any authority to exonerate a public utility for liability as a result of its own negligence by the filing and adoption of a schedule."

"It is part of the service required of a telephone company to furnish every subscriber with a legible telephone directory," said Judge Sugrue. "When it has done this, it has complied with all of the duties imposed upon it by law relative to that part of the business. However, if it sees fit to add additional pages in the nature of classified lists of paid advertisements, it is going beyond that duty and is entering upon a separate and distinct line of business, the advertising business. Having elected to do so, it is subject to the same rules of law as are applicable to other persons or corporations exclusively engaged in supplying space for advertising purposes."

The citation of cases by Ohio Bell counsel in support of a claim that the public utilities commission has authority to regulate advertising in telephone directories was dismissed by Judge Sugrue with the statement that this control merely has to do with rates.

Dr. Quilter's license was revoked July 10, 1934, on the ground that he had used the letters "M. D." after his name in a telephone directory advertisement. Restoration of his license was ordered by Judge Sugrue March 9, 1935, after holding the evidence disclosed that the appearance of the "M. D." in the directory was due to a proofreading error.

▼ ▼

Protest Against Rates and Proposed Service Change

H. A. Tool, an officer of the Co-operative Credit Association at Murdock, Neb., has complained to the Nebraska State Railway Commission that it would not serve the interests of the community if the Lincoln Telephone & Telegraph company were permitted to transform the exchange into an automatic station, and also that the rates are excessive. He has backed this up with a petition of 26 signatures asking a reduction in the rates now charged, from $2 for rural farm lines to $1.25 and for business from $3 to $1.50.

The company has filed an answer denying that the rates are excessive and points to the fact that present operations are being conducted at a loss. The company also takes the position that the proposed change in service is a matter of internal management and is not subject to the jurisdiction of the commission. A hearing on the complaint was scheduled for July 23.

▼ ▼

Permanent Injunction in Directory Infringement

Judge John McKnight, of the federal district court at Jamestown, N. Y., on July 6, granted a permanent injunction against James E. Gowan, of that city, restraining him from publishing and distributing a classified directory of the Jamestown area. He held that the directory in question infringed upon the copyrighted directory of the plaintiff, the Jamestown Telephone Corp., and constituted unlawful and unfair competition.

The defendant and his attorney, John S. Leonard, failed to appear at the hearing on the petition of the telephone company for a permanent injunction. Halpern & Friedman, of Buffalo, represented the plaintiffs. The defendant is ordered to deliver, upon oath, for impounding and destruction, all copies of his directory in his possession or under his control.

The decision is against Mr. Gowan, individually and doing business under the assumed name and style of Jamestown Advertising Sales. It rules that the plaintiff is the sole and exclusive pro-

Buyer's Weekly Guide

CABLE—LEAD ENCASED

Kennecott Wire and Cable Company, Subsidiary of Kennecott Copper Corporation (formerly American Electrical Works), Phillipsdale, R. I.—Paper telephone cable, switchboard cable, bare copper wire. Chicago office: 20 N. Wacker Drive; Cincinnati: Traction Bldg.; New York: 100 E. 42nd St.

CORDS, CABLE AND WIRE

Lenz Electrical Manufacturing Co., 1751 N. Western Ave., Chicago—Established 1904—telephone and switchboard cords for all makes of equipment, braided and lead-covered telephone cable, flame-proof jumper wire, interior telephone wire, switchboard wire.

CORDS AND WIRE

Runzel Cord & Wire Co., 4727-31 Montrose Ave., Chicago — Telephone and Switchboard Cords, Flame-proof Jumper Wire, Switchboard Wire, Interior Telephone Wire. W. L. Runzel, President, has devoted over 40 years to the making of fine telephone cords.

POLES

B. J. Carney & Co., 100 N. 7th St., Minneapolis, Minn.—Western red cedar poles. Pentrex Butt Treated or Plain.

International Creosoting and Construction Co., Galveston, Texas — Creosoted Southern Yellow Pine Poles. Plants: Beaumont and Texarkana, Texas.

Jordan Bros. Lumber Co., Box 84, Norfolk, Va.—Virginia White Cedar Poles. Plain or charred and creo-treated butts.

MacGillis & Gibbs Company, Milwaukee, Wis.—Northern White and Western Red Cedar Poles. Plain or butt-treated. Immediate quotations on request.

T. M. Partridge Lumber Co., Minneapolis, Minn.—Northern White—Western Red Cedar Poles. Plain or butt treated.

H. Sigalet & Company, Ltd., Lumby, B. C., Canada—Western Red Cedar Poles. Plain or Butt treated.

Valentine Clark Corporation, 2516 Doswell Ave., St. Paul, Minn.—Finished Cedar Poles. Plain or Butt treated.

prietor of the telephone directory in Jamestown, of the copyright therein and of the right to publish, print and distribute the book.

The decision restrains any further duplication or revision or any other imitation or colorable imitation of the plaintiff's directory and from copying or adapting any material contained therein and from it in any form or manner whatsoever infringing or trespassing upon the plaintiff's right as owner of the copyrighted material in the Jamestown telephone directory published by it and in the past thereof known as the Jamestown classified telephone directory.

The history of this case was set forth in TELEPHONY of April 4 and May 30.

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Service Restored Between Scandia and Courtland, Kans.

Free telephone service has been restored by the Scandia Telephone Co. between Scandia and Courtland, Kans., as a result of a decision by the Kansas State Corposition Commission.

This line was destroyed by the Republican River floods last June and the Scandia company contended that the benefits derived did not justify the expense of restoring the service, but the state commission held that the mutual communication connections between the two towns was sufficiently helpful to be replaced.

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Nebraska Exchange Authorized to Close

Authority has been given the Emmet Telephone Co. by the Nebraska State Railway Commission to close its exchange at Emmet, Holt county. Application was made by John Conard, manager, who said that the number of subscribers had decreased to the point where revenues were insufficient to even meet operating expenses and that the owners could no longer go into their pockets to keep it operating.

He presented a petition signed by 60 per cent of the subscribers who have had rental or exchange service contracts with the company for the six months preceding. No one appeared at the hearing to object.

It developed that although obligated under the law to do so, the company had never filed any reports with the commission and had no authority from it to charge any rate schedule. The town has less than a hundred inhabitants, and service had dropped to the point where only seven paying subscribers remained.

Arrangements have been made to serve the few remaining patrons from the O'Neill exchange of the Northwestern Bell Telephone Co. The plant at Emmet was largely owned by Mr. Conard, who did all the work in recent months.

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Hearing Assigned on Motion to Dismiss Complaint

On July 8, counsel for Roy Burnham, of Akron, Ohio, filed an answering brief with the Ohio Public Utilities Commission on the motion of the Ohio Bell Telephone Co. to dismiss his complaint of the collection of rental to cover term of disconnection for non-payment of bill, in which he attempts to distinguish the New Bremen decision by pointing out the fact that a contract had existed between the New Bremen company and municipality.

This brief further argues that there is a coincidence of jurisdiction of the courts and the public utilities commission, citing Article 174a, 33, Ohio jurisprudence. The commission has assigned the motion for argument on September 10.

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Commission Rulings and Schedule of Hearings

Federal Communications Commission Washington, D. C.

July 10: Telephone Division granted application of American Telephone & Telegraph Co., asking for authority to supplement existing facilities between Watertown, N. Y., and the International Boundary (United States-Canada).

July 10: Telephone Division granted application of the American Telephone & Telegraph Co., asking for authority to supplement the existing toll facilities between Marinette, Wis., and Escanaba, Mich., a distance of approximately 66.5 miles, by the provision of an additional circuit.

July 16: In the cases of the Intra State Telephone Co., of Galesburg, Ill. the Capital City Telephone Co., of Jefferson City, Mo.; and the Princeton Telephone Co., of Princeton, Ind.; Telephone Division ruled that the Bell does not hold a controlling interest in these companies. Therefore, the companies are exempt, under Section 2-(b)-(2) of the Communications Act of 1934, from the provisions of the Act, except insofar as Sections 201-205 may apply.

July 16: Examiner's report recommends that an order be issued to the effect that the Bell does not hold a controlling interest in the DeKalb-Ogle Telephone Co., of Sycamore, Ill., and that it be exempt, under section 2-(b)-(2) of the Communications Act of 1934, from the provisions of the Act, except insofar as sections 201-205 may apply to it.

July 16: Telephone Division set for oral argument, at a date to be determined later, the case of the Cass County Telephone Co., of Harrisonville, Mo., on exceptions to the examiner's report.

September 8: Oral argument to be presented before Telephone Division on the exceptions of the Champaign Telephone Co., Urbana, Ohio, to the examiner's report, No. 111-4.

Arkansas Department of Public Utilities

July 8: Hearing in the commission's investigation of the rates charged by

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the Boone County Telephone Co., of Harrison.

July 9: Hearing on motion filed by Fadjo Cravens, Fort Smith city attorney, to dismiss an appeal filed by the Southwestern Bell Telephone Co. from a Fort Smith ordinance, providing penalties for refusal to install other than coin box telephones in public and semi-public business houses.

Telephone officials, in filing the appeal, charged that the Fort Smith ordinance is arbitrary and was passed without notice to the telephone company. Company officials said that about 220 Fort Smith customers had been asked to relocate their telephones to eliminate free use of business telephones by the general public, or to install the coin-type instruments, where the public must pay to use the telephone. Of the 200 cases, about 150 were adjusted, and the ordinance resulted from objections on the part of the other customers who refused to permit installation of the telephones in places inaccessible to the public.

Illinois Commerce Commission

July 21: Hearing in Springfield on complaint of the Eldorado Lions Club, the Federal Wholesale Corp., James Coleman, N. Schwartz, Wm. F. Johnson, Robert Lindsay, and John Nameth, against the Illinois Commercial Telephone Co., as to service rendered by it to telephone patrons in Eldorado.

July 21: Hearing in Springfield on joint application of the Illinois Bell Telephone Co. to sell, and of the Illinois Commercial Telephone Co. to purchase, certain interests in toll line property in counties of Henderson and Warren.

July 21: Hearing in Springfield on application for purchase by the Illinois Bell Telephone Co. from the American Telephone & Telegraph Co., a certain telephone pole line in Champaign County.

July 21: Hearing in Springfield on application of the Illinois Bell Telephone Co. for authority to purchase from the American Telephone & Telegraph Co., an interest in certain cable in Chicago-Grand Rapids toll line in the city of Blue Island, Cook County.

July 22: Hearing in Springfield on application of the Central Illinois Telephone Co., for a certificate of convenience and necessity to construct and operate an electric transmission line near the city of Chatham, Sangamon County.

Missouri Public Service Commission

July 9: Application filed by the Missouri Union Telephone Co. to issue mortgage notes.

July 16: Order issued, dismissing complaint of Central Telephone Co., against the Ludlow Telephone Exchange.

Nebraska State Railway Commission

July 14: In the matter of the application of the Farmers Telephone Co., of Clatonia, for authority to extend its lines; dismissed for want of jurisdiction.

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POSITION WANTED—Wire chief or troubleman, local or common battery. Married. Claude R. Wiandt, Rt. 6, Jackson, Tenn.

EXPERIENCED line, switchboard and instrument repair man wants work. Independent company. Good reference. Will go any place. Address 8487, care of TELEPHONY.

POSITION WANTED—Young man, telegraph and telephone inside maintenance and engineering experience. Have excellent record in Bell, foreign and international service. Address 8488, care of TELEPHONY.

POSITION WANTED — Commercial representative, 7 years with Bell System, university graduates, age 32, capable, aggressive, thoroughly familiar with business office and sales practices. Address 8483, care of TELEPHONY.

ENGINEER and plant superintendent, eleven years Bell and Independent experience, university graduate, age 33, capable of handling plant and personnel problems in practical and progressive manner, desires position with greater opportunity for advancement. Address No. 8465, care of TELEPHONY.

CONSCIENTIOUS, all around telephone man of 15 years' experience wants position as manager and repairman of magneto system. Write 8547, % TELEPHONY.

July 14: In the matter of the application of the Western Telephone Corp. for cancellation of permit issued in 1931 to issue $344,000 of bonds; it appearing that the corporation has never exercised any rights of sale of bonds under this order and desiring now to clear up its books, ordered that request be granted.

July 14: In the matter of the application of the Milburn & Anselmo Telephone Co. for authority to continue for an indefinite period the rate of 35 cents a month for rural switching; it appearing that this rate, originally fixed by the commission for the period ending January 1, 1936, and that the company, by oversight, had continued the charge since that date, after full consideration the commission finds that the rate should be continued until further order of the commission.

Ohio Public Utilities Commission

July 16: Authority given for the sale by George B. Quatman of all the property of the Ottawa Mutual Farmers Telephone Co. to the Ottawa Telephone Co. for the agreed consideration of $77,920 and the issue by the latter in payment therefor of 395 shares of no par common stock at a total declared value of $37,920 and, at the principal sum thereof, a first mortgage 20-year, 6 per cent note for $40,000.

July 16: The Ohio Associated Telephone Co., which has outstanding $329,040 par value of 7 per cent cumulative preferred stock, callable for redemption at 105, petitioned for authority to issue $329,100, 6 per cent cumulative preferred stock to provide for the conversion of the 7 per cent stock and to finance additions to plant.

The company stated that the owners of some of the shares of 7 per cent stock will waive the premium while those who must be paid can be accommodated out of the surplus cash on hand. Upon considering the petition, the commission authorized the transaction.

July 16: Finding that the proposed new rates are not excessive or unreasonable and will not earn the applicant a greater return than it is entitled to, commission authorized the Northwestern Ohio Telephone Co., to establish effective August 1, the following rates in service in Wauseon and Tedrow:

Business independent line, $4.25; business two-party, $3.75; business rural, $3.25; residence independent line, $2.75; residence two-party, $2.00; residence rural, $2.00 and discount 25 cents.

July 16: Following notice to all subscribers affected and in the absence of any objection, commission authorized the Ohio Associated Telephone Co. to abandon the remote control exchange at Neptune and hereafter to furnish service in that area from the Celina central exchange, at the prevailing rate in Celina.

Pennsylvania Public Service Commission

July 6: A reduced tariff schedule, designed to save subscribers $10,000 annually, filed by the Columbia Telephone Co., serving Elizabethtown, Marietta, Mt. Joy and Columbia. Monthly charges for individual business lines were cut from $5 to $4 and private residence lines from $3.50 to $3.

The commission said the decreased rates, effective July 1, resulted from informal conferences initiated by it with the utility company.